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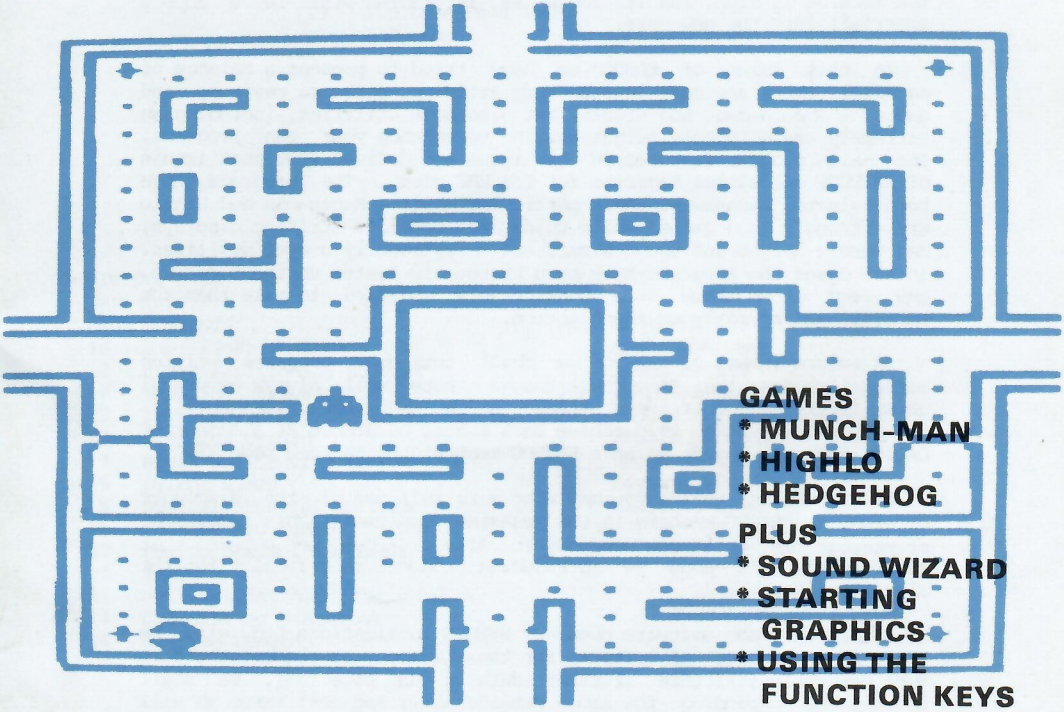
ELBUG

FOR THE ELECTRON

Vol 1 No 1 November 1983



GAMES
* **MUNCH-MAN**
* **HIGHLO**
* **HEDGEHOG**

PLUS
* **SOUND WIZARD**
* **STARTING GRAPHICS**
* **USING THE FUNCTION KEYS**

PLUS
* **NEWS, REVIEWS**
* **HINTS & TIPS**

And much more

EDITORIAL

Welcome to ELBUG. You will find in its pages a collection of programs, articles, hints and ideas that help you to get the most from your Electron. The Electron is a powerful machine, and it is our aim to support it to the full. If you have suggestions or contributions for the magazine, then please do not hesitate to contact us.

As you will see, we have called our magazine ELBUG, rather than ORBIT, the name of the user group. This is because the name ORBIT is already in use as a periodical title, and has been registered for that purpose.

We hope by now that you have been able to get your hands on an Electron, and have made good use of our Introductory Cassette. In spite of early indications, Acorn admit that Electrons are not coming onto the market in the volumes that they had intended. The demand for the machine is high, and it looks as if there will be a supply shortfall into the new year.

In this issue of ELBUG we have tried to present a balance of material. There are some introductory articles, software reviews, and games - Munch-man and Highlo, but also some utilities, including an extremely useful double height routine to enhance your own programs. The main program features in this issue are derived from past issues of BEEBUG, our sister magazine for the BBC micro. The programs have been selected because of their particular merit - Munch-man and Highlo are extremely good games, while Union Jack provides striking displays, and Double-Height and Sound Wizard are exceptionally useful utilities. In all cases the programs have been thoroughly tested on the Electron, and very often have been considerably modified to make them run smoothly and speedily on the Electron.

In future issues of ELBUG we shall introduce programs written especially for the Electron, though there will always be useful cross-fertilization of ideas between the two magazines. Incidentally, if you would like to purchase back issues of BEEBUG as a member of ORBIT, then you may do so at a BEEBUG member's price (see page 35).

As a member of ORBIT, you may also make full use of the discounts offered to BEEBUG members in the magazine supplement. This supplement at present has a strong BBC micro flavour, but we expect that advertisers will soon be introducing products specifically for the Electron.

BEEBUGSOFT, the software house of BEEBUG Publications Ltd. will be producing a range of software for the Electron. At present there is just one title available (further details on page 35). We shall shortly be expanding the range considerably; and next issue we will announce the first Software Club items for the Electron.

David Graham

ELBUG MAGAZINE

GENERAL CONTENTS

PAGE	CONTENTS
2	Editorial
4	Using Programs Published in Elbug
5	Munch-Man
8	The Acorn Electron Reviewed
11	Sound Wizard
13	Electron Graphics (Part 1)
16	Double Height Characters
17	Highlo Card Game
19	The First Electron Software from Acornsoft
22	Union Jack
23	Using the Programmable Function Keys
25	The Introductory Cassette
26	Three Tape Recorders for the Electron
28	News
29	Electron Book Index
31	Hedgehog

HINTS & TIPS

PAGE	CONTENTS
10	RND(-TIME)
10	Finer Positioning of Text
10	Scanning Strings
12	SOUND Frequency
12	Graphics Origin
15	Break and Control Break
15	Silent Games
18	Logical/Physical Colours
21	Control Key Codes
21	Hex to Decimal and Back
34	TRACE
34	Self Validating GET Routine
34	Calculating X Squared
34	Program Length

PROGRAMS

PAGE	CONTENTS
5	Munch-Man Game
11	Sound Wizard
13	Graphics Example Program
16	Double Height Characters
17	Highlo Card Game
22	Union Jack Display
23	Keyset Program
31	Hedgehog Game

USING PROGRAMS PUBLISHED IN ELBUG

by Mike Williams

As this is the first issue of ELBUG, we thought it would be a good idea to give you some guidance about the programs we will be publishing in the magazine (including those in this issue), in order to help you get the best results from the printed listings.

All our programs are listed directly from computer in order to avoid any transcription or typographic errors. For those who wonder how this is posible with the Electron, the programs are developed and tested on that micro, before saving on cassette and then reloading on a BBC micro for printing.

Most of our ELBUG programs will be in Basic, but occasionally part of a program will be in a different language called assembler (or machine code). This is the language that your micro really uses and understands. Basic is provided in ROM in order to interpret programs in Basic in a way that can be understood by the Electron.

Another chip in your Electron contains the Operating System (O.S. for short). This is a special form of program which looks after the general organisation of what is going on inside your micro. It contains a set of very useful routines that, once in a while, we shall want to refer to directly.

When you are typing a program into your Electron from a listing in ELBUG, you must do this as accurately as you can. Even mistyping just a single character in a whole program can cause the program to malfunction. Spaces are important and should always be included whenever they appear in the listing. Normally spaces will be single spaces, but check with characters in the line above or below if you need to count how many spaces to enter. There is one exception here, the space immediately following the line number may be omitted. This is generated by the LISTO command for clarity.

Remember, as you type a program into your Electron, to terminate each line by pressing the return key. In the text of articles in ELBUG, where we want to indicate this, we represent it by <return> to make everything quite clear. However, to save space, we don't do this with complete listings of programs. We will also use the angle brackets, < and >, similarly for other purposes when the need arises.

As you type in a program, it is a good idea to save a copy from time to time, even though the program is incomplete. This will avoid any catastrophe that might otherwise require you to retype everything. Do this particularly, if you want a rest or are going to leave the micro unattended for a while.

Once the outline program has been typed in and saved, you can try running the program. Don't be too dismayed if it doesn't work correctly first time. If you get an error message, then list the line referred to on the screen, and check carefully with the magazine listing. If you are sure that the line is correct, yet the computer persists in indicating an error in that line, then the problem is probably an error in an earlier line that has remained undetected until now. Note which variables are used in that line and check any (or all if necessary) of the previous lines in the program that also used those variables. This is a common answer, but you may have to think of other alternatives. When you have the program working correctly, it is a good idea to save two copies on cassette for added security.

We cannot, in a general guide like this, cope with all the possible errors you might generate. Sometimes there will be no other remedy than to check through the entire program from beginning to end checking every line. A careful and methodical approach to typing the program in to your Electron to start with can save an awful lot of time later. In particular be careful not to confuse the letter O with zero, or lower case L with one (these are printed differently in our listings); and be sure to keep spaces the way they are.

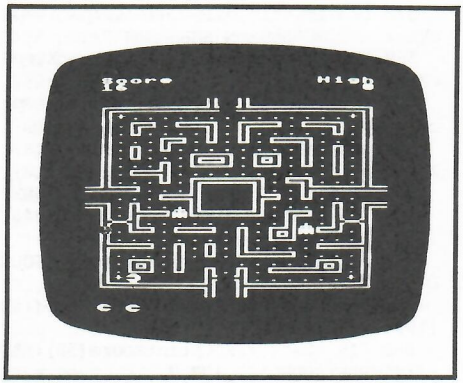
MUNCH-MAN

by Andrew Hynes

Munch-Man is a very well written version of the popular arcade game PAC-MAN. The game, although written in Basic, is quite fast and enjoyable. You take the part of a hungry 'mouth' scurrying around a maze, eating dots to score points. There are three ghosts that chase you and try to kill you. These ghosts move through walls, thus making it harder for you. To combat these ghosts you can eat a power pill, situated in the 4 corners of the maze, and these cause the ghosts to turn yellow and run away. While the ghosts are in this state you can eat them to gain massive bonus points.

Once you have cleared a display, a new screen appears, and you carry on until you lose three lives. Happy eating!

The best strategy for this game is to make use of the power pills, and the tunnels - because in this implementation the ghosts do not chase you through the tunnels.




```
  10 REM Program Munch-Man
  20 REM Author A.Hynes
  30 REM Version E1.0
  40 REM ELBUG November 1983
  50 REM Program subject to Copyright
  60:
  70 *FX 11,1
  80 *FX 12,1
  90 ON ERROR GOTO 2150
 100 MODE5:VDU23,1,0;0;0;0;
 110 PROCCHARSET
 120 ENVELOPE 1,1,4,-4,4,10,20,10,126,
0,0,-126,126,126
 130 H%=0:DIM maze$(19,24),ghost(2,2)
 140 REPEAT
 150 PRINTTAB(5,2)"MUNCHMAN"TAB(6,9)"*
.....UP"TAB(6,11)"?...DOWN"TAB(6,13)"Z.
..LEFT"TAB(6,15)"X..RIGHT"
 160 VDU17,6,31,6,21,238,17,1,32,32,24
3,32,243,32,243:PROCspace
 170 lives%=3:score%=0:sheet%=0:ghost=
0:dir$=" "
 180  PROCsetupmaze:TIME=0:fruit=0:EAT
=0
 190 COLOUR7:PRINTTAB(1,0)"Score"TAB(1
4)"High"
 200  PROCprintscore(0):PRINTTAB(19-LE
N(STR$(H%)),1);H%:COLOUR3:PRINTTAB(1,29
)STRING$(lives%-1,CHR$237+" ")" "
 210 REPEAT:*FX 15,0
 220 ghost=ghost+1:IF ghost=3:ghost=0
 230 PROCpacman:PROCcheck
 240 IF EAT=1:SOUND1,-14,150,1
 250 IFTIME>2000ANDfruit=0ANDtot%<150:
PROCfruit
 260 IFRND(1)>.9:PROCdoor
 270  IFfruit=1ANDTIME>3000/sheet%:PRO
Cnofruit
 280 IFTIME>1500/sheet% ANDEAT=1:EAT=0
 290 UNTIL tot%=187 OR KILL=1
 300 IF tot%=187:GOTO 180
 310 PROCkilled:IF lives%>0:GOTO 200
 320 PROCend:UNTIL FALSE
 330:
 340 DEFFNcalcX(X)
 350 IF X>19:X=0
 360 IF X<0:X=19
 370 =X
 380:
 390 DEFFNcalcY(Y)
 400 IF Y>24:Y=0
 410 IF Y<0:Y=24
 420 =Y
 430:
 440 DEFPROCtime(T)
 450 TM=TIME:REPEAT UNTIL TIME>TM+T
 460 ENDPROC
 470:
 480 DEFPROCprintscore(S%)
 490 score%=score%+S%
 500 COLOUR7:PRINTTAB(1,1);score%
 510 ENDPROC
 520:
 530 DEFPROCpacman
```

```
  540 OX%=pacX%:OY%=pacY%:SC=score%:IF
pac$<>CHR$246:OP$=pac$
  550 dir$=INKEY$(0)
  560 IF dir$=":" pac$=CHR$239:pacY%=pa
cY%-1
  570 IF dir$="/" pac$=CHR$240:pacY%=pa
cY%+1
  580 IF dir$="Z" pac$=CHR$238:pacX%=pa
cX%-1
  590 IF dir$="X" pac$=CHR$237:pacX%=pa
cX%+1
  600 pacY%=FNcalcY(pacY%):pacX%=FNcalc
X(pacX%)
  610 IF dir$="" AND pac$=CHR$246 THEN
 pac$=OP$ ELSE IF dir$="" pac$=CHR$246
  620 A$=maze$(pacX%,pacY%)
  630  IF A$=".":PROCprintscore(2):SOUN
D1,1,60,1:tot%=tot%+1
  640  IF A$=CHR$244:PROCprintscore(100
):PROCnofruit:SOUND1,1,150,2
  650  IF A$="+":PROCprintscore(50):EAT
=1:TIME=0:SOUND1,1,100,2
  660 IF SC=score% AND A$<>" ":pacX%=OX
%:pacY%=OY%
  670 VDU17,3,31,OX%,OY%+3,32
  680 PRINTTAB(pacX%,pacY%+3);pac$
  690 maze$(pacX%,pacY%)=" "
  700 ENDPROC
  710:
  720 DEFPROCruboutghost(G%):COLOUR1
  730 M$=maze$(ghost(G%,1),ghost(G%,2))
  740 IF M$="." OR M$="+":COLOUR2
  750 IF M$=CHR$244:COLOUR1
  760 IF M$=CHR$245:COLOUR5
  770 PRINTTAB(ghost(G%,1),ghost(G%,2)+
3)maze$(ghost(G%,1),ghost(G%,2))
  780 ENDPROC
  790:
  800 DEFPROCghost(G%):C=0
  810  PROCruboutghost(G%)
  820 IF EAT=1:COLOUR2 ELSE COLOUR1
  830 IFEAT=0:DX%=1:DY%=1 ELSE DX%=-1:D
Y%=-1
  840 IFG%=0:PROCvert:IFC=0:PROChoriz
  850 IFG%=1:PROChoriz:IFC=0:PROCvert
  860 IFG%=2:PROChoriz:PROCvert
  870 PRINTTAB(ghost(G%,1),ghost(G%,2)+
3)CHR$243
  880 ENDPROC
  890:
  900 DEFPROCvert
  910 A=FNcalcY(ghost(G%,2)+DY%)
  920 B=FNcalcY(ghost(G%,2)-DY%)
  930 IFpacY%>ghost(G%,2):ghost(G%,2)=A
:C=1
  940 IFpacY%<ghost(G%,2):ghost(G%,2)=B
:C=1
  950 ENDPROC
  960:
  970 DEFPROChoriz
  980 A=FNcalcX(ghost(G%,1)+DX%)
  990 B=FNcalcX(ghost(G%,1)-DX%)
 1000 IFpacX%>ghost(G%,1):ghost(G%,1)=A
:C=1
 1010 IFpacX%<ghost(G%,1):ghost(G%,1)=B
:C=1
 1020 ENDPROC
 1030:
 1040 DEFPROCdoor
 1050 D%=RND(4):RESTORE1880
 1060 FORF%=1 TO D%:READX,Y:NEXT
 1070 IF X=pacX% AND Y=pacY%:GOTO 1050
 1080 IF maze$(X,Y)=" ":maze$(X,Y)=CHR$
245 ELSE maze$(X,Y)=" "
 1090 VDU17,5,31,X,Y+3,ASC(maze$(X,Y))
 1100 ENDPROC
 1110:
 1120 DEFPROCfruit
 1130 VDU17,1,31,9,18,244
 1140 fruit=1:TIME=0
 1150 maze$(9,15)=CHR$244
 1160 ENDPROC
 1170:
 1180 DEFPROCnofruit
 1190 VDU31,9,18,32:fruit=0
 1200 maze$(9,15)=" "
 1210 ENDPROC
 1220:
 1230 DEFPROCcheck:KILL=0
 1240 FOR G%=0 TO 2
 1250 IF G%=ghost:PROCghost(G%)
 1260 IF ghost(G%,1)<>pacX% OR ghost(G%
,2)<>pacY%:GOTO 1280
 1270  IF EAT=1:PROCprintscore(250):SOU
ND1,1,250,1:PROCsetupghosts(G%) ELSE KI
LL=1
 1280 NEXT
 1290 ENDPROC
 1300:
 1310 DEFPROCkilled:COLOUR3
 1320 FOR C=237 TO 242
 1330 VDU31,pacX%,pacY%+3,C
 1340 SOUND1,1,C/2,1:PROCtime(20)
 1350 NEXT
 1360 VDU31,pacX%,pacY%+3,32
 1370 FOR G%=0 TO 2
 1380  PROCruboutghost(G%)
 1390  PROCsetupghosts(G%)
 1400 NEXT
 1410 PROCpac:lives%=lives%-1
 1420 ENDPROC
 1430:
 1440 DEFPROCend
 1450 IF score%>H%:H%=score%
 1460 COLOUR7:PRINTTAB(19-LEN(STR$(H%))
,1);H%
 1470 PROCspace
 1480 ENDPROC
 1490:
 1500 DEFPROCspace:*FX 15,0
```

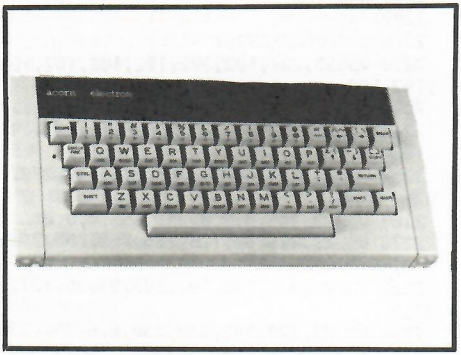
```
 1510 VDU17,15,31,1,30:PRINT"SPACE BAR
TO START"
 1520 REPEAT UNTIL GET=32:VDU12,17,7
 1530 ENDPROC
 1540:
 1550 DEFPROCsetupghosts(G%)
 1560 RESTORE 1870
 1570 FOR D%=0 TO G%:READ COL,X:NEXT
 1580 ghost(G%,1)=X
 1590 ghost(G%,2)=12
 1600 ghost(G%,0)=COL
 1610 ENDPROC
 1620:
 1630 DEFPROCpac
 1640 pacX%=9:pacY%=20:pac$=CHR$237
 1650 ENDPROC
 1660:
 1670 DEFPROCsetupmaze
 1680  FORG%=0TO2:PROCsetupghosts(G%):N
EXT
 1690 PROCpac:tot%=0:sheet%=sheet%+1
 1700 COLOUR128:RESTORE 1890
 1710 FOR D%=3 TO 27
 1720 READ maze$
 1730 FOR E%=0 TO 19
 1740 A$=MID$(maze$,E%+1,1)
 1750 IF A$>="A" AND A$<="M":M$=CHR$(AS
C(A$)+159):COLOUR1 ELSE M$=A$:COLOUR2
 1760 PRINTTAB(E%,D%)M$
 1770 maze$(E%,D%-3)=M$
 1780 NEXT
 1790 NEXT
 1800 VDU19,2,9,0,0,0,19,4,14,0,0,0
 1810 FOR D%=1 TO 21
 1820 SOUND 2,-15,D%*2,1
 1830 SOUND 1,-15,D%*3,1
 1840 NEXT:VDU20
 1850 ENDPROC
 1860:
 1870 DATA 1,1,5,9,6,18
 1880 DATA 9,1,9,22,2,15,17,15
 1890 DATA"        A A         "
 1900 DATA" CBBBBBBL LBBBBBBBD "
 1910 DATA" A+.............+A "
 1920 DATA" A.CI.JBD.CBI.JBD.A "
 1930 DATA" A.G....A.A.....G.A "
 1940 DATA" A...CI.G.G.JBD...A "
 1950 DATA" A.H.G........A.H.A "
 1960 DATA" A.G...CBD.CD.A.A.A "
 1970 DATA" A...H.EBF.EF.G.A.A "
 1980 DATA" A.JBK..........G.A "
 1990 DATA" A...G.CBBBD.JD...A "
 2000 DATA"BLBI...A    A..MBBBLB"
 2010 DATA"   ...JBK    MI.G...   "
 2020 DATA"BD.H...A    A....H.CB"
 2030 DATA" A.MBI.EBBBF.CI.A.A "
 2040 DATA" M K..... ...A..M K "
 2050 DATA" A.EI.JBI.H.CK.JF.A "
 2060 DATA" A........A.EF....A "
 2070 DATA" MBBI.H.H.A....JBBK "
 2080 DATA" A....A.G.EBBI....A "
 2090 DATA" A.CD.A.. .....CD.A "
 2100 DATA" A.EF.G.H.H.JBBLF.A "
 2110 DATA" A+.....M K......+A "
 2120 DATA" EBBBBBBK MBBBBBBBF "
 2130 DATA"         A A          "
 2140:
 2150 ON ERROR OFF
 2160 MODE 7: *FX12
 2170 *FX15
 2180 REPORT:PRINT" at line ";ERL
 2190 END
 2200:
 2210 DEFPROCCHARSET
 2220 VDU23,224,102,102,102,102,102,102
,102,102
 2230 VDU23,225,0,255,255,0,0,255,255,0
 2240 VDU23,226,0,127,127,96,96,103,103
,102
 2250 VDU23,227,0,254,254,6,6,230,230,1
02
 2260 VDU23,245,0,0,0,255,255,0,0,0
 2270 VDU23,246,60,126,255,255,255,255,
126,60
 2280 VDU23,228,102,103,103,96,96,127,1
27,0
 2290 VDU23,229,102,230,230,6,6,254,254
,0
 2300 VDU23,230,102,102,102,102,102,126
,126,0
 2310 VDU23,231,0,126,126,102,102,102,1
02,102
 2320 VDU23,232,0,254,254,6,6,254,254,0
 2330 VDU23,233,0,127,127,96,96,127,127
,0
 2340 VDU23,234,102,230,230,6,6,230,230
,102
 2350 VDU23,235,102,231,231,0,0,255,255
,0
 2360 VDU23,236,102,103,103,96,96,103,1
03,102
 2370 VDU23,237,60,126,255,224,224,255,
126,60
 2380 VDU23,238,60,126,255,7,7,255,126,
60
 2390 VDU23,239,36,102,231,231,231,255,
126,60
 2400 VDU23,240,60,126,255,231,231,231,
102,36
 2410 VDU23,241,0,0,42,0,34,0,42,0
 2420 VDU23,242,8,73,42,0,99,0,42,73
 2430 VDU23,243,126,90,219,255,213,171,
255,219
 2440 VDU23,244,198,56,108,222,190,222,
108,56
 2450 ENDPROC
```

This program was adapted from a version for the BBC micro first published in Beebug Vol.2 No.5.

THE ACORN ELECTRON REVIEWED

by David Graham and Mike Williams

The Electron is the third microcomputer to be produced by Acorn in almost as many years, and follows the Atom and the enormously successful BBC micro. Indeed, the Electron is not a completely new machine for it contains many of the features that have made the BBC micro so popular. In appearance, the Electron is quite new and its smart looks are sure to attract many customers. The price of £199 will also bring the Electron within the pocket of many potential purchasers. So what do Acorn provide for the money?

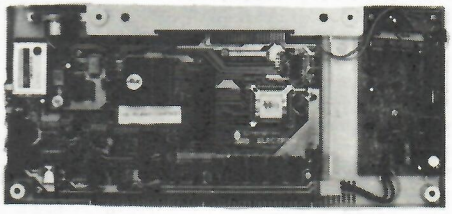


First of all, it looks as though the supply difficulties encountered by early BBC users will not be repeated with the Electron. Our review machine was a production model, and this is a good sign, as it suggests that production lines have been gearing up since well before the launch. In other ways too, Acorn have learned from their experiences with the Beeb. The packaging has been well thought through, and the documentation is far better than that received by early Beeb owners.

ELECTRON PACK

Apart from the machine itself, the pack contains a large moulded plug with built-in transformer, a UHF TV lead, an introductory cassette, and two books. One of these is a manual, spiral bound for easy opening. This is well planned, with a detailed list of contents. A strong minus point is its lack of index, and we would urge Acorn to append an index to the release version of the manual. Apart from this the manual is excellent. The introductory chapters have clearly been written with great care to introduce the new owner gently to the use of their new Electron. Later chapters provide a comprehensive guide to the Basic language and also to 6502 assembler.

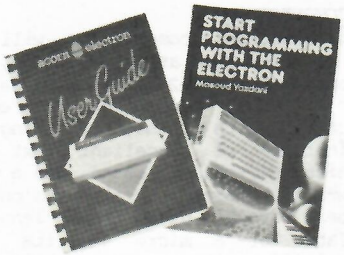
The second book 'Start Programming with the Electron' by Masoud Yazdani (published by Addison-Wesley) is an admirable introductory text. What is so impressive about it, is that it introduces fully structured programming right from the start. In the first chapter it introduces the PRINT statement alongside PROC and ENDPROC. Procedures are fundamental to structured Basic, and it is nice to see them being introduced in this way. Our one serious reservation about this book is again its lack of index in the release version. We have, however, managed to obtain a full index from the author for publication in this first issue of ELBUG, and we understand that this index will be included in future editions of the book.



MACHINE HARDWARE

The machine is well constructed, and has a good feel to it. It has a good quality keyboard of 56 keys, though this is rather noisy in operation. The keyboard allows entry of both upper and lower case characters and includes a number of special keys, such as the

cursor keys, all of which provides flexibility and convenience. A function key (marked FUNC) allows all the number keys to be defined by the user (see article in this issue of ELBUG on Programmable Function Keys) while the same Func key used with the other keys on the keyboard allows direct entry of most Basic keywords. This is a useful facility implemented by the Electron's operating system.



As far as external connections go, the Electron is rather limited as it only carries six connections to the outside world. Somewhat unexpectedly, three of the Electron's sockets are for the visual display (UHF, video and RGB). This leaves the power input socket, a cassette socket (with motor control), and an edge connector to be used with external interfaces. There is no provision for the connection of a printer to the basic machine, possibly the most obvious omission, nor is there any provision to connect disc storage units at present. However, it is unlikely that many Electron users will be bothered by this initially.

Acorn have a number of planned add-ons to upgrade the Electron, but these will not be available for several months, though add-ons from other suppliers have already been announced.

INNARDS

Internally, the Electron's circuitry is well laid out. There are two separate circuit boards, one for power supplies and the main computer board containing the CPU or central processor unit (6502A). This board also contains 32k of user memory together with Basic in ROM, and the Electron's operating system in EPROM. Be warned though, as you will lose at least 11.5k of memory for use by the operating system and for graphics which can grow to as much as 23.5k in some modes. This can cause problems for experienced users but is unlikely to trouble the beginner. See Electron Graphics part 1 for further details.

PRINCIPAL FEATURES

The version of Basic used on the Electron is the same BBC Basic used in the BBC micro. This provides, on the Electron, 7 different display modes giving a choice of 20, 40 or 80 characters per line, high, medium or low resolution graphics, and up to 16 colours. These actually consist of six colours plus black and white, all of which can be steady or flashing colours, to give the total of 16. There is also a trade off between the number of colours available at any time and the resolution (the best resolution is 250 points vertically by 640 points horizontally but only allows two colours). Remember too, that the quality of the image will also depend upon the TV or monitor you use with your Electron.

Overall, the Electron really is capable of very good colour graphics, and these facilities are very easy to use from Basic. Even the novice programmer will find it easy to produce interesting and colourful displays. The graphics represent one of the best features of the Electron and so we have included in this issue of ELBUG, the first of a series of articles, telling you how to make the most of your Electron's graphics powers.

A series of commands controls the choice of colour and the drawing of lines and filling of areas. A powerful feature is the ability to define your own graphics characters, which is very useful when writing games programs. There are also two sound channels, controlled by the SOUND and ENVELOPE commands and this is another fascinating feature of the Electron that we shall be talking about in future issues of ELBUG.

BBC Basic also includes all the usual mathematical and string handling

functions plus file processing instructions. One of the most powerful features of BBC Basic is the provision of structured programming support, particularly in the form of procedures. This encourages the writing of clear, readable programs and greatly assists in program development. The book by Yazdani, included in your Electron pack, is a good introduction to this style of programming.

BBC Basic also contains a good 6502 Assembler, and machine code routines are readily incorporated into Basic programs. Your Electron also provides a good screen editor. This is not a full screen editor, as found on some micros, but it is very easy to use indeed. With a program listed on the screen, four cursor control keys are used to move the cursor around on the screen, and a Copy key allows new instructions to be created by copying existing characters from the cursor position. This is a feature which works very well in practice.

VALUE FOR MONEY

Although not immediately apparent to the user, one of the economies that has been made with the Electron is to use an unusual configuration of RAM (Random Access Memory). Because of the way in which this memory is addressed, the Electron's speed of operation varies depending on the amount of memory being used to support graphics. Writing programs for action packed games will need some careful designing to achieve maximum speed. In future issues, we will be introducing you to techniques for getting the best performance out of your Electron.

THE COMPETITION

The Electron's competition will be from machines such as the Spectrum, the Dragon and the VIC-20. Broadly speaking the Electron compares extremely favourably with these, offering a combination of excellent text and graphics, two-channel sound, and a full typewriter keyboard. It also has one of the best versions of the Basic language available for a micro and its high compatibility with the very popular BBC micro will add to its attraction at school and in the home. The promised add-ons should prove to be a further incentive in favour of this well designed micro.

HINTS HINTS HINTS HINTS HINTS HINTS HINTS HINTS HINTS

RND(-TIME)

If you use random numbers in a program and want to make sure that every time you run the program, you get a different random sequence, then put Z=RND(-TIME) to initialise the random number generator. TIME is a variable which is automatically incremented every 100th of a second. No matter how fast you can load your program and run it, the sequence of numbers will always be different (to obtain the same sequence a second time, you would need to enter and run the program again from a cold start in exactly the same time, to 100th of a second!).

FINER POSITIONING OF TEXT

To put text at a specific character position you should use PRINT TAB(X,Y). To position text more finely, to line up with a graphics image for instance, use the command VDU 5. Then use MOVE X,Y where X and Y are in normal graphics co-ordinates followed by the PRINT statement which will display text at the graphics cursor position. VDU 4 will return to the normal printing procedure.

```
E.g.VDU5:MOVE100,100:PRINT "ELBUG":VDU4
```

SCANNING STRINGS

To scan through all the letters of a string extracting each one in turn use:

```
FOR A=1 TO LEN(A$) : PRINT MID$(A$,A,1) ; : NEXT
```

Here we are simply scanning through the string and printing it out one character at a time. In your own programs you may well want to do something a little more extensive with each character.

SOUND WIZARD

by Alan Webster

To make the most of the sound capability of your Electron, you need to use two commands, SOUND and ENVELOPE. The sound command is relatively easy to use. It has four parameters Q,A,P,D. Q selects the sound channel number (Ø or 1), A switches the sound on or off or selects the envelope, P selects the pitch of the sound, and D the duration. Try the following example:

SOUND 1,-15,50,100 <return>

This will produce a beep. Increasing the value of the third parameter (50) will increase the pitch, while altering the value of the fourth parameter (100) will alter the duration of the note. You may like to experiment with this a little before progressing. Further details are given in the User Guide p.116.

The ENVELOPE command is more complicated to use, and allows the pitch of a note to be varied while it is being played. With a combination of SOUND and ENVELOPE parameters you can produce a wide variety of differnt sounds. Putting them together manually is somewhat laborious, and this is where SOUND WIZARD comes in. It provides 8 preset envelopes, and allows you to experiment with these in combination with any chosen set of sound parameters. When you find a combination which sounds good, it allows you to copy the parameters down for use in your own programs. Try typing this program into your Electron and then running it. The computer will ask you to type in values for the sound channel (Ø-1), the envelope number (1-8), the pitch (Ø-255) and the duration (Ø-255). Type a number followed by Return each time.

You should now hear the sound, and the SOUND parameters will be displayed on the screen. You may now enter a new set of parameters, or if you press ESCAPE, the computer will tell you at which program line the appropriate envelope is to be found (for you to transcribe into another program).

Additional envelopes could be added between lines 400 and 500, but you must also include the line number of each envelope in the list at line 210. As only one envelope can be defined at any time, the envelopes have to be redefined when required, using PROCENV(E) where E is the envelope number.

Here are some examples to try:

CHANNEL	ENVELOPE	PITCH	DURATION
1	1	200	40
1	2	200	50
1	3	4	100
Ø	3	5	40
1	4	50	100
1	5	200	150
1	6	Ø	10
1	7	20	100
Ø	8	6	20

```
  10 REM Sound Wizard
  20 REM Version E1.2
  30 REM by A.Webster
  40 REM ELBUG November 1983
  50 REM Program subject to Copyright
  60 ON ERROR GOTO 510
  70 E=0
  80 MODE 6
  90 PRINTTAB(13,0)"SOUND WIZARD"
 100 PRINTTAB(12)"by Alan Webster"
 110 PRINT'TAB(9)"8 ENVELOPES DEFINED"
 120 PRINTTAB(0,5);" Channel  Envelope
 Pitch  Duration"
 130 INPUTTAB(1,7),C:INPUTTAB(10,7),E
 140 INPUTTAB(20,7),P:INPUTTAB(27,7),D
 150 PROCENV(E)
 160 SOUND C,1,P,D
 170 PRINTTAB(0,16);"SOUND ";C;",";E;"
,";P;",";D;SPC(100);
 180 PRINTTAB(0,7);SPC(40);TAB(0,15);"
ENVELOPE ";E;SPC(5);:VDU30
 190 GOTO 90
 200 DEFPROCENV(X)
 210 ON X GOTO 230,250,270,290,310,330
,350,370
 220 GOTO 380
 230 ENVELOPE 1,1,-15,-15,-15,230,230,
230,126,0,0,-126,126,126
```

```
  240 ENDPROC
  250 ENVELOPE 1,1,4,2,-2,5,5,5,126,0,0
,-126,126,126
  260 ENDPROC
  270ENVELOPE1,1,6,0,-6,200,100,200,126
,0,0,-126,126,126
  280 ENDPROC
  290 ENVELOPE 1,1,-50,-50,-50,20,-20,2
0,126,0,0,-126,126,126
  300 ENDPROC
  310 ENVELOPE 1,1,-100,100,-100,100,-1
00,100,126,0,0,-126,126,126
  320 ENDPROC
  330 ENVELOPE 1,1,10,10,10,230,230,230
,126,0,0,-126,126,126
  340 ENDPROC
  350 ENVELOPE 1,3,0,1,0,0,255,0,126,0,
0,-126,126,126
  360 ENDPROC
  370 ENVELOPE 1,3,0,1,0,0,255,0,126,0,
0,-126,126,126
  380 ENDPROC
  390:
  400 REM Add Extra Envelopes Here.
  500:
  510 ON ERROR OFF
  520 IF ERR<>17 REPORT:PRINT " at line
 ";ERL:END
  530 IF E=0 PRINT''':END
  540 PRINTTAB(0,20);"LIST line ";(20*E
)+210
  550 END
```

HINTS HINTS HINTS HINTS HINTS HINTS HINTS HINTS HINTS

SOUND FREQUENCY - A.J.Vincent

The Sound command is of the form SOUND C,V,F,D where F is the frequency specified as a number in the range 0 to 255. You can use the following function to convert a frequency, measured in Hertz, to the correct frequency parameter for use with the SOUND command:

```
DEF FNfreq(F)=INT(((LOG(F)-LOG(33))*48/LOG(2)-42)+.5)
```

The following short program shows how this function can be used to produce notes of different frequencies:

```
    10  INPUT'"Please enter the frequency of the sound you
require",frequency
    20 X%=FNfreq(frequency)
    30 PRINT "The value of the frequency parameter to be used in the SOUND
command is ";X%
    40 SOUND 1,-15,X%,30
    50 END
    60 DEF FNfreq(f)=INT(((LOG(F)-LOG(33))*48/LOG(2)-42)+.5)
```

GRAPHICS ORIGIN

Don't forget that the graphics origin may be moved by the VDU 29 command:

```
VDU 29,640;512;
```

moves it to the centre of the screen. This is often more convenient for drawing circles and polygons. You can also move the origin more than once in the same program, since the definition of the origin is always taken from the bottom left corner of the screen. VDU 29,0;0; will reset the origin to this default.

This little program repeatedly changes the origin randomly, and draws a square starting at the new origin each time:

```
    10 MODE 4
    20 VDU 29,RND(1280)-1;RND(1024)-1;
    30 MOVE 0,0
    40 DRAW 100,0
    50 DRAW 100,100
    60 DRAW 0,100
    70 DRAW 0,0
    80 GOTO 20
    90 END
```

ELECTRON GRAPHICS (Part 1)

by David Graham

One of the striking features of the Electron is its graphics capability. We begin here a series of articles exploring Electron graphics.

WHICH MODE TO USE ?

One excellent feature of the Electron is the wide choice of graphics modes available to the programmer. The disadvantage is that it is not immediately obvious which of the 7 modes to use for any given task. Generally speaking there are five features to watch out for when choosing a mode for a particular task.

1. Text size (20, 40 or 80 columns)
2. Graphics resolution
3. Number of colours
4. Amount of memory used
5. Speed of execution

Table 1 gives a breakdown of these features for each mode. As you can see the first 3 factors above are traded off against the fourth and fifth. That is to say, the finer the text required, or the finer the graphics resolution, or the higher the number of colours, the more memory that is used, and the slower the speed of execution.

In fact memory is an extremely important factor on the Electron, and although the machine is equipped with 32k of RAM (Random Access Memory), the higher resolution modes leave very little for actually storing and running programs. So choosing a mode for anything but the shortest of programs is usually a compromise of the various factors involved.

The most economical overall is mode 6, but this only allows two colours (one background and foreground - eg white on black etc), and only supports text and user defined characters. This is the mode to use if you have a very long program which does not need elaborate screen displays - such as a filing program or word processor. At the other extreme is the very popular mode 2. This uses a great deal of memory, but allows quite high resolution graphics, and most important, it is the only mode to give all 16 colours. It is this mode which is used for most arcade games on the BBC micro, and it is likely that the same will be true of the Electron.

TABLE 1

Mode	No. of chars.	No. of graphics pixels	No. of colours	Memory used	Remaining memory	Relative speed*
0	80 x 32	640 x 256	2	20k	5k	11.8s
1	40 x 32	320 x 256	4	20k	5k	11.8s
2	20 x 32	160 x 256	16	20k	5k	11.9s
3	80 x 25	text only	2	16k	9k	9.5s
4	40 x 32	320 x 256	2	10k	15k	5.6s
5	20 x 32	160 x 256	4	10k	15k	5.6s
6	40 x 25	text only	2	8k	17k	5.6s

*Speed to execute the program TIMETEST. This column can only give a general idea of relative speed, since this varies with the code being executed.

```
10 REM TIMETEST
20 TIME=0
30 FOR A%=1 TO 200
40 X=SIN(12)
50 NEXT
60 PRINT TIME
```

Mode 5 can be seen as a compromise between mode 2 and mode 6. Its resolution is the same as that of mode 2, but it only uses half the memory, and gives only 4, rather than 16, colours. The better graphics games in Basic tend to use mode 5 rather than mode 2 simply because good games programs in Basic are usually too long to allow the use of mode 2, whereas machine code programs (most arcade type games are written in machine code) can just squeeze into the available space.

The advantage of mode 4 over mode 5 is the text size. Text in mode 5 (20 characters per line) generally lacks clarity, (try listing a program in this mode!), whereas mode 4 allows full graphics and 40 character text (but only 2 colours).

CREATING GRAPHICS.

There are three ways to produce graphics on the Electron:

1. User defined characters
2. PLOT and DRAW line graphics
3. Direct screen access.

The first method uses a facility on the Electron to define characters at will, and then to move them around the screen using PRINT statements or their equivalent. This is well suited to games applications. The second uses a set of graphics commands on the Electron to draw lines and triangles (filled or unfilled), and from these to build up more complex shapes. This is ideal for graphical representations such as pie charts, bar charts and function plotting. In practice many programs use a combination of 1 and 2. The third method can produce similar effects to the first, but it is done by sending codes directly to the screen. It is complicated, and best suited to machine code use, and is generally not recommended for reasons of compatibility with later Electron add-ons.

USER DEFINED GRAPHICS

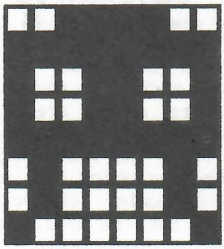
We will begin by looking at the method of User Defined Characters. This is an extremely flexible method, allowing a great variety of displays, and is particularly useful in games writing.

User defined graphics is treated on page 93 of the User Guide, and you should refer to this for further details. It is not treated in Yazdani.

The user defined facility on the Electron allows you to define (or redefine) all of its 256 allowed characters. All characters used on the Electron have an associated number code (0 to 255). The way to print a character from its code is by using the CHR$ expression. Try

PRINT CHR$ 65 <return>.

This will print the character 'A' on the screen because the so called ASCII code for A is 65. CHR$66 will give 'B', and so on. For reasons that will be made clear later, the best character codes to choose for user definition are those from 224 to 255. They are undefined from switch on.



Invader

Try executing PRINT CHR$224 <return>. Nothing will be printed (at least it won't if you have just switched on). Now type VDU23,224,255,0,255,0,255,0,255,0 <return> then try PRINT CHR$224 <return> again. It should now give a character with horizontal bars. In fact in the VDU 23 call above (used to define the character 224), each value 255 produced a horizontal line in the block, and each zero, a blank line. The User Guide shows you more fully how each of the last 8 parameters of the VDU 23 call are made up to produce any given shape. The first parameter of all (224 in this case) specifies which character number is to be redefined.

To take the mental strain out of all this, our ELBUG introductory cassete contains a program called Redefine. If

you run this, you can use the cursor keys to create an 8 x 8 character to your choice, and the program automatically prints out the VDU23 call to use in order to recreate that character in your own program. Suppose you have produced the invader shape shown. The program would print out:

VDU23,#,60,255,153,153,255,66,66,129.

To use this in a program, put in VDU23,224,60,255,153,153,255,66,66,129 at an early stage, then executing PRINT CHR$224, will produce the invader.

You may like to try to produce your own characters. As a further example page 114 of the User Guide gives the 4 card suit shapes. You might also like to define an alternative character set, either for foreign alphabets - eg the accented letters of French, or a different style alphabet from the one provided.

MOVING A CHARACTER

To place a character at any chosen position on the screen, use the TAB statement. For example, the statement:

```
PRINT TAB(10,20) CHR$224
```

will place your character 10 spaces from the left on the 20th line down; always assuming that character 224 has been previously defined of course.

To move a character across the screen, you must place it at successive positions across the screen. Try the following program.

```
100  REM MOVING INVADER
110 MODE4
120 VDU23,224,60,255,153,153,255,66,6
6,129
130 FOR A%=1 TO 38
140 PRINT TAB(A%,10) CHR$224
150 NEXT
160 END
```

When you run this program you will get an almost unrecognisable string of invaders across the screen. The FOR ... NEXT loop (see Yazdani p.18 if you are unfamiliar with FOR loops) has successfully printed the invader some 38 times across the screen, but there are two problems. First of all it moves too fast. To resolve this insert a delay - type in the line

```
145 TIME=0: REPEAT UNTIL TIME=10
```

The second problem is that the invader leaves a trail across the screen. To get rid of this we must erase the previous invader each time that we print a new one. To achieve this, change line 140 to:

```
140  PRINT TAB(A%,10)SPC1;CHR$224
```

The effect of the "SPC1" is to print a single space to the left of the invader each time that it appears. This automatically erases the previous one. As an exercise you might like to try moving the invader from right to left.

Next month we will look more closely at user defined graphics, and will introduce techniques for moving larger characters, for producing multicoloured characters, and for animating them.

HINTS HINTS HINTS HINTS HINTS HINTS HINTS HINTS HINTS

BREAK AND CONTROL BREAK

The Break key on the keyboard will stop any program running and reset the computer into Basic at the prompt. Having pressed Break use the command OLD to retrieve the program, otherwise Basic will assume that there is no program in memory.

Pressing Ctrl-Break (i.e. pressing Control and Break together) has a similar effect to pressing Break alone, except that more of the internal settings are returned to their starting values. The most important of these are the key definitions which are cleared completely. Thus programs which define the Break key (function key 10) to restart themselves may be stopped by pressing Ctrl-Break. The OLD command will still restore the current program in memory.

SILENT GAMES

Typing *FX210,1 <return> will switch off all sound output. Do this before loading a program from cassette. To re-enable sounds either press Break or type *FX210,0 <return> after the program has finished running.

Enlarge your text displays with this useful utility. It will really make your programs stand out.

BJORN GRAND'S

DOUBLE HEIGHT CHARACTERS

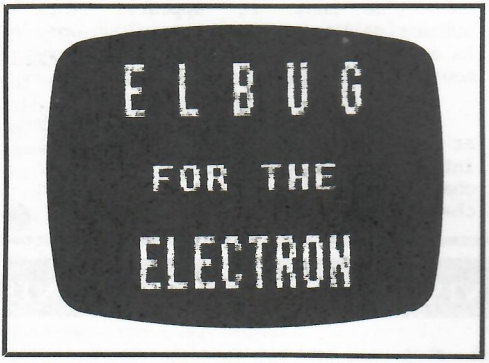
Large size text on the screen can add impact to your programs, but with the Electron there is no simple facility for generating double height characters. To overcome this we present a procedure which allows double height printing in any of the graphics modes. This is extremely useful for making more prominent displays, often needed in education and for games. The procedure, called PROCdouble, is defined in lines 1000 to 1120 and is very easy to use. Simply add it on to the end of your program, and it can then be called as a normal procedure. For example

```
PROCdouble("FORTY-TWO",5,10)
```

will display "FORTY-TWO" in double height characters, and in a position on the screen, 10 characters down from the top and 5 characters in from the lefthand side. The string can be a string variable, and the co-ordinates can also be variables.

We have put the procedure PROCdouble following a short program in lines 10 to 150 to show you how to use it. This program calls the procedure three times in order to display three lines of double height text on the screen. Why not type the program into your Electron and then run it to see the results?

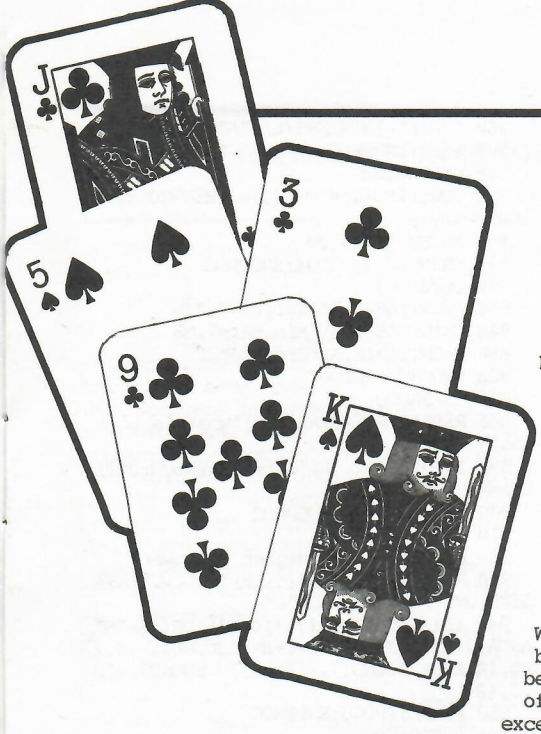
If you want to use this procedure in one of your own programs, you are recommended to consult the Electron User Guide, pages 200 and 201, which tell you how to merge Basic programs together.




```
  10 REM Program DOUBLE
  20 REM Version E1.1
  30 REM Author Bjorn Grand
  40 REM ELBUG November 1983
  50 REM Subject to COPYRIGHT
 100 MODE 2
 110 COLOUR 6:COLOUR 128+4
 120 PROCdouble("ELBUG",6,3)
 130 PROCdouble("for the",6,9)
 140 PROCdouble("ELECTRON",6,15)
 150 END
1000 DEF PROCdouble(A$,K,L)
1010 LOCAL N
1020 A%=&A:X%=0:Y%=&A
1030 D=&A00
1040 FORN=1 TO LEN(A$)
1050 B$=MID$(A$,N,1)
1060 ?D=ASC(B$)
1070 CALL (&FFF1)
1080 VDU23,240,D?1,D?1,D?2,D?2,D?3,D?3
,D?4,D?4
1090 VDU23,241,D?5,D?5,D?6,D?6,D?7,D?7
,D?8,D?8
1100 PRINT TAB(K+N,L);CHR$(240);TAB(K+
N,L+1);CHR$(241)
1110 NEXT N
1120 ENDPROC
```

This program was adapted from a version for the BBC micro first published in BEEBUG Vol.2 No.1.

The same procedure is used in the MENU program on the introductory ELBUG cassette. It is situated there, in lines 500 to 730. You may find it quicker to load the MENU program from cassette, delete lines 10 to 490 and simply type in from the magazine listing, lines 10 to 150.



HIGHLO CARD GAME

by R Bailey

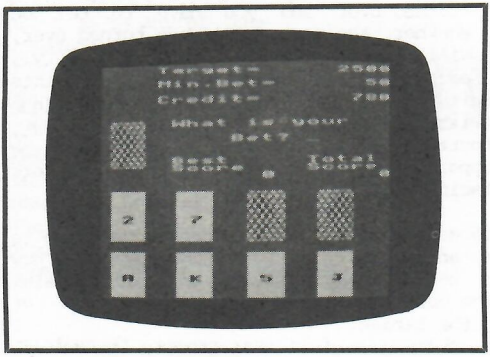
HIGHLO is a simple card game, but one which rapidly becomes quite addictive. It is based on the TV show, 'Play Your Cards Right'. You are presented with 9 cards face down on the screen. The first card is turned over and you have to bet on whether the next card, when turned over, will be higher or lower in value. If you reach or exceed the target of 2500 points with each set of cards, then you continue with a new set of cards. With the first, fourth and seventh cards, you also have the opportunity to change the card before placing your bet.

With each card you have to decide how much to bet, and you will need to think carefully how best to do this, depending on the face value of the card displayed, if you are to reach or exceed the target.

The screen presentation is excellent and contains full user prompts throughout for playing the game. If you enjoy games of chance then this is the game for you.

```
   10REM Program HIGHLO
   20REM Version E1.2
   30REM Author R.Bailey
   40REM ELBUG November 1983
   50REM Program subject to Copyright
   60ON ERROR GOTO 1060
   70X=RND(-TIME)
   80VDU23,224,206,219,219,219,219,219,
206,0
   90MODE5:DIMA(12),B$(9),S(12):@%=&000
00908
  100BS=0
  110VDU28,4,16,19,0:VDU19,128,4,0,0,0,
19,2,0,0,0,0
  120RT=0:CLS
  130C=250:MB=50:AIM=2500
  140F=0:PROCT:RESTORE:FORJ=1TO9:READX,
,Y:PROCC:NEXT
  150 PROCS:PROCV:RESTORE:F=1
  160 FORJ=1TO9:READX,Y:PROCC:PROCSH:IF
J=9THEN200
  170 IFC<MB J=9:GOTO210
  180 IFJ=1ORJ=4ORJ=7THENPROCCH
  190 PROCQ:PROCU:PROCHL
  200 NEXT
  210 CLS:RT=RT+C:IFC>=AIM THEN330
  220 IFRT>BS THENBS=RT
  230 IFC<MB THEN310
  240 PRINTTAB(0,2)"You have failed"
  250 PRINTTAB(1,4)"to reach the"
  260 PRINTTAB(4,6)"TARGET"
  270 PROCBS
  280 PRINTTAB(0,8)"ANOTHER GAME?"
  290 PRINTTAB(4,10)"Y/N":A$=GET$
  300 IFA$="Y"THEN120ELSE CLG:PRINTTAB(
0,10)"SEE YOU SOON":TIME=0:REPEAT:UNTIL
TIME=200:MODE6:END
  310 PRINTTAB(0,2)"You have failed"
  320 PRINTTAB(2,4)"miserably":GOTO270
  330 PRINTTAB(0,9)"CONGRATULATIONS":GO
TO130
  340 DATA50,10,350,10,650,10,950,10
  350 DATA50,260,350,260,650,260,950,26
0,50,560
  360 DEFFNX=150-Z*30
  370 DEFFNY=200-Z*40
  380 DEFPROCC
  390 GCOL0,3
  400 MOVEX,Y:DRAWX,Y+200:DRAWX+150,Y+2
00:PLOT85,X,Y
  410 DRAWX+150,Y:DRAWX,Y:PLOT85,X+150,
Y+200:IFF=1THENENDPROC
  420 GCOL0,1:FORZ=0TO4
  430 MOVEX,Y+Z*40:PLOT1,FNX,FNY
  440 MOVEX+Z*30,Y:PLOT1,FNX,FNY
  450 MOVEX,Y+FNY:PLOT1,FNX,-FNY
  460 MOVEX+Z*30,Y+200:PLOT1,FNX,-FNY
  470 NEXT:ENDPROC
  480 DEFPROCS
  490 FORJ=1TO12
```

```
500 A(J)=RND(52):F=0
510 IFJ=1THEN540
520 FORK=1TOJ-1:IFA(J)=A(K)THENF=1
530 NEXT
540 IFF=1THEN500
550 NEXT
560 FORJ=1TO12:FORL=1TO4
570 IFA(J)>13THENA(J)=A(J)-13:S(J)=L
580 NEXT:NEXT:ENDPROC
590 DEFPROCCH
600 PROCD:PRINTTAB(2,8)"Change card?"
610 PRINTTAB(6,10)"Y/N":REPEAT:A$=GET$
```




```
620 UNTILA$="Y"ORA$="N"
630 IFA$="N"THEN680
640 IFJ=1THENA(J)=A(10):S(J)=S(10)
650 IFJ=4THENA(J)=A(11):S(J)=S(11)
660 IFJ=7THENA(J)=A(12):S(J)=S(12)
670 PROCV:PROCC:PROCSH
680 PROCD:ENDPROC
690 DEFPROCV
700 FORL=1TO9
710 B$(L)=CHR$(A(L)+49)
720 IFA(L)=9THENB$(L)=CHR$224
730 IFA(L)=10THENB$(L)="J"
740 IFA(L)=11THENB$(L)="Q"
750 IFA(L)=12THENB$(L)="K"
760 IFA(L)=13THENB$(L)="A"
770 NEXT:ENDPROC
780 DEFPROCSH
790 VDU5:IFS(J)=1ORS(J)=3THENGCOL0,1E
LSEGCOL0,2
800 MOVEX+50,Y+100
810 PRINTB$(J):VDU4:ENDPROC
820 DEFPROCT
830 PRINTTAB(0,1)"Target=",AIM
840 PRINTTAB(0,3)"Min.Bet=",MB
850 PRINTTAB(0,5)"Credit=",C
860 PROCBS:ENDPROC
870 DEFPROCQ
880 REPEAT:PRINTTAB(0,8)"What is your
 bet"
890 INPUTTAB(2,10)"Bet= "B:PROCD:UNTI
LB>=MB ANDB<=C
900 C=C-B:PROCD:ENDPROC
910 DEFPROCHL
920 PRINTTAB(0,8)"Higher or lower"
930 REPEAT:PRINTTAB(5,10)"H/L...":A$=
GET$:UNTILA$="H"ORA$="L"
940 IF(A$="L"ANDA(J+1)<A(J))OR(A$="H"
ANDA(J+1)>A(J))THENC=C+B*2:SOUND1,-10,2
00,10 ELSE SOUND 1,-10,20,10:SOUND1,-10
,1,10
950 PROCD:PROCU:ENDPROC
960 DEFPROCD
970 PRINTTAB(0,7)SPC(80):ENDPROC
980 DEFPROCU
990 PRINTTAB(8,5)SPC(8):PRINTTAB(8,5)
,C
1000 ENDPROC
1010 DEFPROCBS
1020 PRINTTAB(1,13)"Best      Total"
1030 PRINTTAB(1,14)"Score     Score"
1040 PRINTTAB(0,15),BS,RT;
1050 ENDPROC
1060 ON ERROR OFF
1070 IF ERR=17 A$="":GOTO 300
1080 MODE6
1090 REPORT:PRINT" at line ";ERL
1100 END
```

This program was adapted from a version for the BBC micro published in BEEBUG Vol.1 No.5.

HINTS HINTS HINTS HINTS HINTS HINTS HINTS HINTS HINTS

LOGICAL/PHYSICAL COLOURS

When using commands such as COLOUR and GCOL you are setting the LOGICAL colour in which these actions occur on the screen, and this is the colour that POINT will return.

The command VDU19,logical,physical,0,0,0 sets up which physical colour the video generation circuitry sends to the television screen when the video system reads through the memory to make up the picture. The 16 physical colour numbers are as listed on page 108 of the Electron User Guide.

THE FIRST ELECTRON SOFTWARE FROM ACORNSOFT

Reviewed by Philip Le Grand

We review here the first of the new software from Acornsoft which has been written for the Electron or adapted from previous BBC micro versions, ready for the Electron's release.

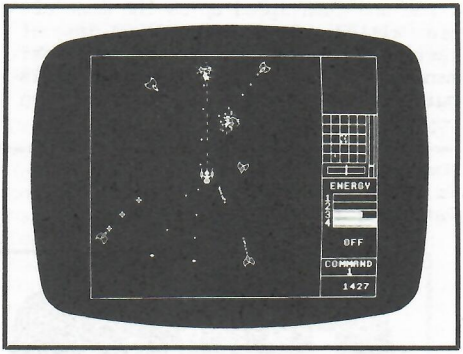
Let us start with some general comments, since the software is all from the same publisher, Acornsoft. This software is generally of a high standard and has been well and attractively packaged for the Electron. Each program comes with documentation, usually as a separate leaflet or booklet, which is also of good quality. There are some references here, to using printers and joysticks, although the basic Electron cannot handle these at the moment. It is also worth noticing that all of the software reviewed here has previously been implemented on the BBC micro, and that one or two of the points raised later may be the result of their adaption to the Electron.

Name : METEORS
Price : £9.20 inc. VAT
Rating : ***

In this game, you control a spaceship in the centre of the screen, which may be rotated left or right, and moved forwards with the thrust control. Your task is to destroy meteorites which float around generally in your direction. If you are hit by them, your ship is destroyed (silently!). If you shoot a meteorite, it divides into smaller parts which still follow you and become harder to destroy. Occasionally a UFO enters the field of view and you score more points by destroying it. If you get into a tight situation you can enter hyperspace and re-emerge anywhere.

In principle, this is a good game, but this implementation is not very exciting. The action is rather slow and the graphics are purely black and white. For the price of £9.20, the other games reviewed here offer better value for money.

Name : Starship Command
Price : £9.20 inc. VAT
Rating : ****



This is an entirely new arcade style game, first developed for the BBC micro. It makes good use of graphics though only in two colours. You are in a starship and you have a visual read-out of position of enemy ships and your energy levels on the right of the screen. Your ship stays in the centre of the screen in the same direction so when you bank left or right, the rest or the universe rotates around you. There are many controls to get used to, all giving extra interest. This is a good game which should sustain your interest for quite some time.

Name : MONSTERS
Price : £9.20 inc. VAT
Rating : ****

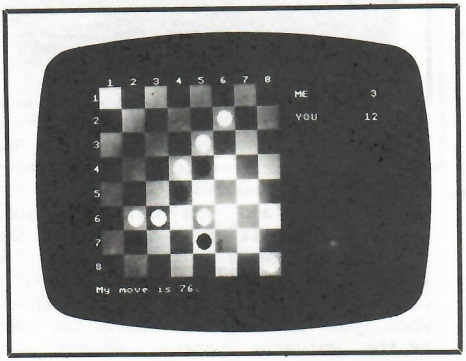
This is an excellent game for showing off the quality of the Electron's colour graphics and is accompanied by a nice variety of computer generated sound effects. You control a man who can run across floors and up and down ladders to other floors, in order to avoid being eaten by the multicoloured monsters. When you find a quiet spot, you dig a hole and hope that a monster falls in. When it does, you can destroy it by filling in the hole again before it can escape.

»

There are different types of monsters, each requiring slightly different tactics.

The more monsters that appear, the slower the game, since the screen handling is all in software on the Electron. This is rather disconcerting as in the course of playing, the game appears to slow down with each new frame and then speed up as the monsters are killed. This is more a game of tactics and strategy rather than fast manoeuvres and quick reaction. It is quite a good program and has been popular on other micros.

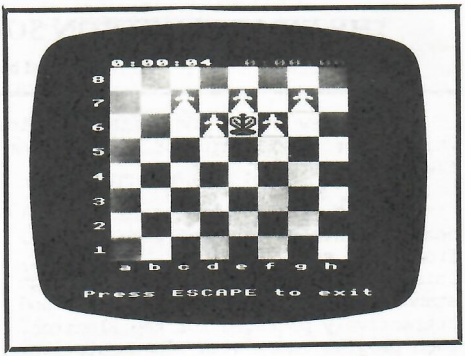
Name : DRAUGHTS & REVERSI
Price : £9.20 inc. VAT
Rating : ****



There is good value for money here, since you get two games in this package for the price of one. The board and pieces are well displayed, giving a 3D effect to the pieces. Both games offer a series of different playing levels but although the computer takes but a few seconds to make its move at the lowest level, at the other extreme you may have to wait up to 45 minutes.

Moves are entered in a co-ordinate form. This pack and the chess pack are good packs to buy if you are fed up with the usual 'seek-em-and-splatt-em' type of games and want something to get your brain into.

Name : CHESS
Price : £9.20 inc. VAT
Rating : ****



The representation of each of the pieces is very good, allowing clear identification of each piece on the board. The program allows several options, some of which are:-
Auto play, where the computer plays itself, the choice of playing black or white against the computer or the computer acting like a real board so that you can play against another opponent. In each mode there is an on-screen clock ticking away and timing the moves, though you can turn the sound off if you want to.

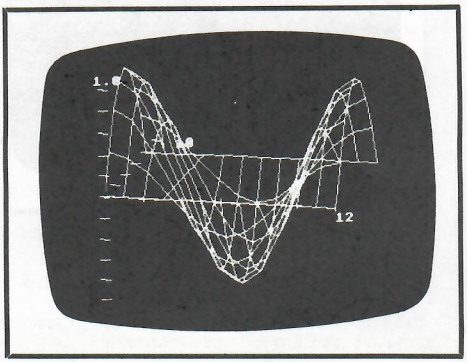
Moves are entered using the usual chess notation. It has 10 levels of skill, taking between 4 seconds and over 7 hours for the first move! (We couldn't bear to continue playing like this!). Quite obviously the program does not use set openings.

Name : PERSONAL MONEY MANAGEMENT
Price : £11.50 inc. VAT
Rating : ****

This is a useful money management package. The program initially assumes that you are an average person with a Current and Deposit account with the following expenses:-
Car/travelling costs, electricity, gas/oil, insurance, mortgages, rates, subscriptions, telephone, standing orders and miscellaneous expenses. You can then add or delete articles as you wish, to tailor the package to your own requirements. This program handles the data for a whole year in monthly units and can give information displays of current savings, budgets, next month's

spending, annual budgets and spending over the last 12 months. All entered data may be saved onto tape and re-entered at any time.

Name : GRAPHS & CHARTS
& CREATIVE GRAPHICS
Price : both cost £9.20 inc. VAT
Rating : ****



These two packs consist of a set of very useful programs and procedures. Both are adapted from earlier versions for the BBC micro for which listings of the programs, plus useful explanations of the techniques involved, were also published as books with the same titles for £7.50 each.

The Graphs and Charts package allows you to produce most types of graph or chart you are ever likely to use, e.g. bar charts, x,y graphs, curve or function plotting, pie charts, 3D curves, 2D contour maps, 3D contour maps and surfaces. The programs are stand-alone units and are useful in, say, educational applications, for producing velocity-time graphs, distribution graphs, colony count charts, etc, or for teaching the use of different methods for displaying data. The procedures can all be included in your own programs for more specific applications.

The graphics covered in the Creative Graphics pack, are mainly plotting graphics, although user defined characters are briefly touched on. Included are methods for drawing a variety of mathematical figures, techniques for movement and animation, and some interesting routines for representing 3D objects. There are also some interesting mathematical curves and a number of other patterns, such as the CARPET program, all of which which produce some very striking effects. The final programs show various scenes which incorporate techniques developed earlier in the book. Both packs can be recommended, particularly for those interested in developing their own programs of this kind.

Supplier: All Acornsoft software can be ordered from Vector Marketing, Dennington Industrial Estate, Wellingborough, Northants, NN8 2RL. Many computer shops and dealers also stock Acornsoft software.

HINTS HINTS HINTS HINTS HINTS HINTS HINTS HINTS HINTS

CONTROL KEY CODES

Some of the more useful control codes, generated by holding down the CTRL key at the same time as pressing certain keyboard letters, are as follows:

Ctrl-G	Beep (same as VDU7)
Ctrl-H	Cursor left (non-erasing)
Ctrl-I	Cursor right
Ctrl-J	Cursor down
Ctrl-K	Cursor up (scrolls screen once top line is reached)
Ctrl-L	Clear text screen
Ctrl-M	Return
Ctrl-N	Turns on paging mode
Ctrl-O	Turns off paging mode
Ctrl-P	Clears graphics screen

HEX TO DECIMAL AND BACK

PRINT ~14 prints the hexadecimal equivalent of 14 i.e. E
PRINT &20 prints the decimal equivalent of 20 (hex) i.e. 32

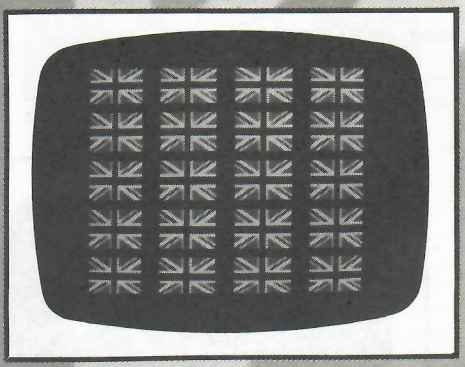
UNION JACK

by David Stonebanks

This program produces a whole series of representations of the Union Jack with various aspect ratios. The display is colourful and eye-catching, and gives a good demonstration of the quality of the Electron's graphics.

Pressing the spacebar down during the running of the program, will freeze the display at the end of the frame in progress. Pressing the spacebar again will release it.

This program was adapted from a version for the BBC micro first published in BEEBUG Vol.1 No.6.



```
  10 REM Program JACK
  20 REM Version E1.1
  30 REM Author David Stonebanks
  40 REM ELBUG November 1983
  50 REM Subject to Copyright
 100 ON ERROR ON ERROR OFF:MODE6:REPOR
T:PRINT" at line ";ERL:END
 110 REPEAT
 120 MODE 1
 130 VDU23,1,0;0;0;0;:REM delete cursor
 140 black=0:red=1:blue=2:white=3
 150 VDU19,blue,4;0;
 160 VDU29,640;512;:REM set graphics
 170 FOR hsize=5 TO 60 STEP 10
 180 vsize=hsize:REM square
 190 PROCunionjack
 200 PROCdelay(100)
 210 NEXT hsize
 220 CLS
 230 FOR hsize=5 TO 60 STEP 10
 240 FOR vsize=5 TO 60 STEP 10
 250 PROCunionjack
 260 PROCdelay(100)
 270 NEXT vsize
 280 CLS
 290 NEXT hsize
 300 CLS
 310 hsize=10:vsize=10
 320 FOR X=160TO1200 STEP 320
 330 FOR Y=100 TO 900 STEP 200
 340 VDU29,X;Y;:REM move graphics origin
 350 PROCunionjack
 360 NEXT Y
 370 NEXT X
 380 PROCdelay(200)
 390 UNTIL FALSE
 400 END
1000 DEFPROCunionjack
1010 PROCbox(blue,12,8)
1020 PROCdiag(white,9,8,-12,-6,12,8,-1
2,-8)
1030 PROCdiag(white,12,8,-12,-8,12,6,-
9,-8)
1040 PROCdiag(white,-9,8,-12,8,12,-6,1
2,-8)
1050 PROCdiag(white,-12,8,-12,6,12,-8,
9,-8)
1060 PROCdiag(red,10.5,8,0,1,12,8,0,0)
1070 PROCdiag(red,0,0,-12,-8,0,-1,-10.
5,-8)
1080 PROCdiag(red,0,0,-12,8,0,-1,-12,7
)
1090 PROCdiag(red,0,0,12,-8,0,1,12,-7)
1100 PROCbox(white,2,8)
1110 PROCbox(white,12,2.5)
1120 PROCbox(red,1,8)
1130 PROCbox(red,12,1.5)
1140 IF INKEY-99 THEN REPEAT UNTIL NOT
INKEY-99:REPEAT UNTIL INKEY-99
1150 ENDPROC
1160 DEFPROCbox(colour,halfx,halfy)
1170 GCOL0,colour
1180 MOVEhalfx*hsize,halfy*vsize:MOVE-
halfx*hsize,halfy*vsize
1190 PLOT85,halfx*hsize,-halfy*vsize:P
LOT85,-halfx*hsize,-halfy*vsize
1200 ENDPROC
1210 DEFPROCdiag(colour,x1,y1,x2,y2,x3
,y3,x4,y4)
1220 GCOL0,colour
1230 MOVEx1*hsize,y1*vsize:MOVEx2*hsiz
e,y2*vsize
1240 PLOT85,x3*hsize,y3*vsize:PLOT85,x
4*hsize,y4*vsize
1250 ENDPROC
1260 DEFPROCdelay(t)
1270 T=TIME+t:REPEAT UNTIL TIME>T
1280 ENDPROC
```

USING THE PROGRAMMABLE FUNCTION KEYS

by Mike Williams

The special offer cassette sent to new ORBIT members contains a program called KEYSET for programming the function keys on the Electron. Now we explain all about this useful feature and the KEYSET program.

If you have read about the use of the Func key in the Electron User Guide (see pages 19, 42 and 43) you will know that you can use this with the other keys on the keyboard to generate directly, many of the Basic keywords. For example, pressing Func/R (i.e. the key marked 'FUNC' and the key marked 'R' together) will produce 'RUN' and is equivalent to typing the same word letter by letter but, of course, much quicker. You will also notice, that the fronts of the numeric keys (1 to Ø) are marked f1, f2 etc. However, if you press for example, Func/f1, nothing happens. This is because these keys do not have any built in functions, but you can program them to produce any character or character string that you want.

How useful this can be is indicated by the KEYSET program on the introductory ORBIT cassette. For example, Func/f8 prints out the amount of free memory left in your machine at any time, and so on. The memory display utility, MEMDISP, also on the same cassette, is another program that uses function keys.

To program a function key, say function key fØ, you type

```
*KEYØ
```

and follow this, on the same line, with the string of characters that will define the function of that key. For example, suppose you would like to have key fØ set mode 6. Try typing in the following, and then press Func/fØ

```
*KEYØ "MODE 6" <return>
```

You should find that the words 'MODE 6' appear on the screen but that nothing else happens. This is because using the function key is just like typing directly on the keyboard, though much quicker because only two keys have to be pressed. When we defined key fØ we did not include a Return (the key marked 'RETURN') at the end of 'MODE 6' as we would when typing it directly from the keyboard. You can complete the command by typing the Return from the keyboard, but it would be better if we could include it in the definition of the function key itself. There is a special way of including Return and other control codes. This uses the '|' character followed by one other character. The '|' character is on the key next to Break. You can find a list of all the control codes in Appendix A of the Electron User Guide. If you look at this, you will see that CTRL/M is exactly the equivalent of Return and this is what we need. So our revised definition for key fØ is now

```
*KEYØ "MODE 6|M" <return>
```

Type this in and then press Func/fØ. Because we have now included the Return, the computer obeys this command straight away, and the screen flashes as it always does when you change mode.

We can set up a function key to do more than just one simple task. Suppose we would like key fØ to not just set mode 6, but also set paged mode (VDU14 or CTRL/N) and issue the command LIST. We can do this as follows

```
*KEYØ "MODE 6|M|N LIST|M" <return>
```

Try typing this on the keyboard of your Electron and then press Func/fØ to see the effect. Of course, unless you have a Basic program in memory at the time, there will be nothing to list on the screen.

In the example above, key fØ has been set up to produce the characters enclosed by quotes. The quotes are not essential, but help to make clear the

beginning and end of the string. If you omit the character string itself, then that clears any existing definition for that key. Function key definitions can also be included as lines in a program.

THE KEYSET PROGRAM

One good way of using the function keys, is to set them up to do all the things you are likely to need when loading, saving and developing programs. A program to do this, called KEYSET, was supplied on the introductory cassette that you received when you joined ORBIT. If you load and run this program (CHAIN"KEYSET" or select from cassette menu), it defines all the function keys and displays a list on the screen to tell you what each function key will do. Of course, this information will not be preserved once you start using the function keys. To help you remember the key functions, we have included in the magazine, a strip for you to cut out or copy, which you can place on the top of your Electron.

The program listing, shown below, will also help you to understand further, some of the techniques to be used in defining function keys.

There are two additional points to note in the listing. Many Basic keywords can be abbreviated (e.g. P. instead of PRINT in line 260) to save space. This information is not given in the Electron User Guide so we shall be publishing this in a future issue of ORBIT. Secondly, a function key definition can contain several Basic instructions separated by the ':' character as shown in line 280. This can also save space.

You will also notice a few minor differences between the version of KEYSET on cassette and that listed here in ELBUG. These are not significant but help to improve the readability of the magazine version. This is the version referred to in this article, since the line numbering differs.

```
  10 REM Program KEYSET
  20 REM Version E1.2
  30 REM ELBUG November 1983
  40 REM Program subject to Copyright
  50 MODE6
  60 VDU19,0,1,0,0,0
  70 *FX18
  80 PRINTTAB(10)"ORBIT KEY SET ROUTINE"
  90 PRINT''"F1 - Load a program from cassette"
 100 PRINT"F2 - Chain a program from cassette"
 110 PRINT"F3 - Verify a program"
 120 PRINT"F4 - Display a catalogue of programs "''     on a cass
ette (and turn motor on)"
 130 PRINT"F5 - Turn cassette motor off"
 140 PRINT"F6 - Mode 6 colour display"
 150 PRINT"F7 - The length of a program (in decimal)"
 160 PRINT"F8 - The amount of free memory (in decimal)"
 170 PRINT"F9 - Line listing after an error"
 180 PRINT"F0 - Formatted listing-Shift to continue"
 190 PRINT''"For further details :-"''    see the first issue of E
LBUG."
 200 *KEY1 LOAD""|M
 210 *KEY2 CHAIN""|M
 220 *KEY3 *LOAD"" 8000|M
```

```
  230 *KEY4 *CAT|M
  240 *KEY5 *MOTOR0|M
  250 *KEY6 MO.6|M VDU19,0,4,0,0,0|M CL
S|M
  260 *KEY7 P.TOP-PAGE|M
  270 *KEY8 DIM P%-1|M P.HIMEM-P%|M
  280 *KEY9 C$="LIST"+STR$ERL+CHR$13:A%
=138:X%=0:F.L=1TOLENC$:Y%=ASC(MID$(C$,L
)):CA.&FFF4:N.|M
  290 *KEY0 MO.6|M LISTO7|M L.|N|M LIST
O0|M
  300 *FX4,0
  310 END
```

MORE ON FUNCTION KEYS

We conclude this article with some more information about defining and using function keys.

The function key definitions that you specify are stored in a reserved area of memory, 256 bytes long and starting at memory address &B00. If you have programmed some, or all, of the function keys, you can save the definitions on tape by typing:-

*SAVE "KEYS1" B00+100 <return>

where KEYS1, or whatever name you choose, is the name of the file on tape. You can then load these definitions back into the Electron at any time, without disturbing any Basic program that you happen to have in the machine, by simply typing

*LOAD "KEYS1" <return>

Of course, this only programs the function keys. No information as to their use will be displayed on the screen as happens when you run the KEYSET program.

Because there is only a limited amount of space in which to store function key definitions, it is often necessary to clear out existing definitions before redefining. This can be done individually as previously described, but *FX18 will clear all existing function key definitions.

The Break key can also be programmed as function key 10, in just the same way as the other function keys. If you then press Break, the machine will carry out a reset as usual, followed by the user programmed definition. A very useful thing to do here, is to program the Break key as follows:-

*KEY10 "OLD|M" <return>

Thus if you accidentally press the Break key the machine will immediately follow reset with the OLD command, restoring your program before any further damage occurs. You will find another example of programming the Break key on page 131 of the Electron User Guide. Similarly, the four cursor control keys and the Copy key can also be re-programmed as keys 11 to 15, though this could be confusing and is thus not to be recommended unless essential.

IF you are not already a member of ORBIT,
Subscribe now, and get a free introductory cassette containing 8 tested programs for the Electron.

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8. **CHARACTER DEFINER.** Define individual graphics characters with this useful utility for use in your own programs

See back cover of the magazine for subscription details

SPACE CITY

RACER

BEEBMAZE

THREE TAPE RECORDERS FOR THE ELECTRON

Reviewed by Matthew Rapier

The Electron is a brand new machine. One of the first peripherals that you will need, to make full use of it, is a good cassette recorder. In this review, Matthew Rapier tests three readily available recorders on the Electron, and reports on his findings.

MACHINES REVIEWED

1.BOOTS	CR325	PRICE £23.95
2.W.H.SMITH	CCR800	PRICE £29.95
3.ACORN	DATA RECORDER	PRICE £29.90

Availability:

These three tape recorders are likely to be sold as compatible with the Electron. The Boots and Smith's machines are readily available through their many retail outlets. The Acorn Data Recorder is available through Acorn dealers or direct from Vector Marketing, Dennington Industrial Estate, Wellingborough, Northants NN8 2RL.

The Smith's and Boots recorders are of a similar shape and overall design, being flat and oblong with six control buttons at the front. The Acorn Data Recorder is slightly different, having its controls on its long edge with the tape inserted beside the controls. All three recorders are of similar average size, about 10 inches long, 6 inches wide and 2 inches high. They all have a flip up lid on top, into which the cassette is inserted.

Other common features include automatic stop/turn off, when reaching the end of a cassette during playback or record, but not during fast forward or rewind. All the machines, except the Data Recorder, can be used in the normal way without the computer, and as such include a built-in microphone and volume control.

All tests on the tape recorders were made using the Electron introductory cassette, supplied by Acorn, tapes produced on the machine itself, and tapes produced on other machines. Most cassette recorders are capable of recording and playback at two different levels, through different sockets and leads. The DIN input/output socket usually has three or five pins. The jack sockets are 3.5 mm in size and will be in a pair on the recorder, one for input, one for output. These two are accompanied, on the machines reviewed here, by a third and smaller (2.5 mm) socket. This allows motor control from the computer.

1. BOOTS CR325

The overall appearance of this machine is very good. It has a tape counter which is easily read, and sliding volume and tone controls, all easily accessible on the top. The controls incorporate a single button for stop/eject and also include a pause button, which can be very useful when using it with the computer.

Both DIN and 3.5 mm jack sockets are available for record/playback. These are located at the front of the machine, below the control buttons. Positioned here they seemed a little in the way, most machines having them to the side.

PERFORMANCE: This machine loaded the introductory cassette and its own tapes reliably. However it would not load tapes produced on the Smith's machine.

2. W.H.SMITH'S CCR800

This recorder is sold by Smith's to accompany their range of home computers. This tape recorder is very slim and has an impressive appearance. A tape counter is provided and is easily read, being located on the top of the machine.

The volume control is located on the left side of the machine, and is not accompanied by any tone controls. The CCR800 features a 'compute mode' switch, which is recommended for use when saving from the computer. This fixes the automatic recording level control to an 'optimum' level.

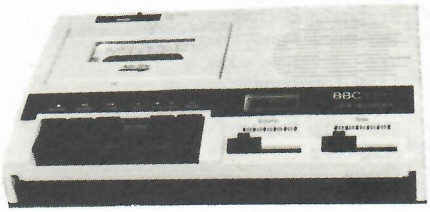
This machine also offers another very useful and unusual feature; the ability to 'cue' and 'review'. This means that if the rewind button is pressed while the play button is locked, the tape will quickly rewind, without resetting the play button, ie. as soon as the rewind button is released, play immediately continues again. The same applies to the fast-forward control. This really is very handy and allows very quick location of, say, the start of a certain program. Unfortunately the machine does not also offer a pause button.

Both DIN and 3.5 mm jack sockets are provided, being located on the left side of the machine.

PERFORMANCE: This machine loaded its own tapes, and those of the Boots machine. It was sometimes difficult to load a program from our introductory cassette.

3. ACORN DATA RECORDER

This new recorder replaces the Ferguson 3T07 recorder previously supplied by Acorn. It is not, contrary to rumour, a digital recorder. The name 'Data Recorder' does not appear to signify any radically new design. Externally this recorder is an attractive beige in colour, although this has a tendency to come off very easily. Our Review machines have all scuffed very quickly to reveal the white plastic underneath. It is reasonably well presented with all the controls at the front together with the easily readable VU meter. The tape counter, however, is behind the tape and is rather small and hard to read. All the standard controls are present including pause. It is unfortunately not possible to "cue"; i.e. have play and fast forward down at the same time, a facility which would greatly speed up searching for programs.



Being designed for use with the Electron and the BBC micro, this cassette recorder has only a single 7 pin din socket. The record and playback levels are fixed so that you cannot set them incorrectly. The result of this is that the user has no control whatsoever on the levels used by the recorder. The volume and tone controls only affect the speaker output so that you can listen to your program loading quietly. The machine has motor control,

working through the 7 pin connector. Unfortunately there is no override on this so that you are forced to use the computer's motor control commands to rewind the tape. This can be very inconvenient. Most tape recorders have the motor control on a separate plug which can be easily removed.

PERFORMANCE: The data recorder proved much the best recorder of the three during tests, being completely reliable on all the tapes we have tried. However the total lack of control over the recorder's output can lead to problems, as we found when reviewing another sample of this recorder for the BBC micro.

CONCLUSION

The Boots recorder is probably the best buy for those trying to obtain a reasonably cheap tape recorder, as it would load reliably on most tapes and is a well built and robust recorder.

The Smith's machine was no more reliable in our tests, and is more expensive. However, it is compact and is very attractive visually.

The Data Recorder gave the best results in our tests, though we have had problems with other samples. For those wishing to spend a little less, the Boots recorder was reasonably reliable and survives punishment much better.

NEWS

PROGRAMS FROM ACORNSOFT

Acornsoft have announced 12 software packages for release at the same time as the Electron. Acornsoft already have a high reputation for their software for the BBC micro and these versions for the Electron will maintain that standard. This first batch contains games, utilities and two extra languages. The full list is as follows:

* Creative Graphics
* Graphs and Charts
* Personal Money Management
  Tree of Knowledge
  LISP Language
  FORTH Language
* Starship Command
* Monsters
* Chess
* Draughts and Reversi
  Snapper
* Meteors

* These programs are reviewed in this issue of ELBUG.

Acornsoft programs are available from Acornsoft Ltd, c/o Vector Marketing Ltd, Dennington Industrial Estate, Wellingborough, Northants NN8 2RL, and from computer shops and dealers.

ELECTRON TO BE SOLD BY W.H.SMITH'S

As well as specialist computer shops and dealers, the new Electron will also be sold in some 200 branches of W.H.Smith & Sons Ltd throughout the country. First supplies are expected to have reached the shops by mid October. W.H.Smith are also setting up in-house 'Computer Shops' in 22 of their larger branches.

ELECTRON ADD-ONS FROM SIR COMPUTERS

SIR Computers of Cardiff are planning to have a number of add-ons available for the Electron by the end of October. These will all plug into the connector at the rear of the micro to provide additional capability. The first of these will provide two extra ports, a Centronics compatible port for connecting a printer to the Electron, and an analogue port, particularly for connecting joysticks to use with games. The second add-on will be an expansion box to accomodate software supplied in ROM format. This will enable the Electron to use the same kind of ROM chips as currently produced for the BBC micro, like the word processing package WORDWISE, and the machine code monitor, EXMON. The third add-on will provide the Electron with a serial RS423 port for communication with other computers.

Further information from SIR Computers Ltd., 91 Whitchurch Road, Cardiff. Telephone (0222) 21341.

ELECTRON BOOK INDEX

Compiled by Masoud Yazdani

Anyone buying a new Electron will receive with it a copy of the book, "Start Programming with the Electron", by Masoud Yazdani, and published by Addison-Wesley. This otherwise excellent book is marred by the lack of an index. We are most grateful to the author for supplying us with a full index, which, we understand, is to be included in subsequent reprintings of the book.

A

Acorn 117
AND 34
argument 64
array 70
ASC 66
ASCII codes 66
assembly language 117
assignment expression 34
auto-repeat 89

B

BASIC 3
block number 20
blocks 20
bugs 7

C

CHAIN 83
CHR$ 66
CLG 96
CLS 5
conditional branching 20
coordinates (relative-) 103
cursor (edit-) 6
cursor (graphic-) 97

D

DATA 59
data 59
debugging 7
DEF 5
DIM 70
dimension 70
DRAW 97

E

editing 4
editor 15
Electron 3
ELSE 19
END 8
ENDPROC 5
ENVELOPE 87
ERL 91
error messages 7
error-trapping 91
Exeter University 117
expression 32

F

FALSE 34
FOR 18
FORTH 117
functions (inbuilt-) 35
functions (own-) 35

G

GCOL 105
GOTO 91
GREETER program 82

I

IF 19
immediate mode 4
information 58
INKEY 90
INPUT 61
INSTR 78
introductory cassette 24

K

keyboard 1
keyword (BASIC-) 4

L

LEFT 18
LEFT$ 78
LEN 75
LIST 5
LOAD 20
LOCAL 36
LOGO 30
loop 18

M

machine code 14
mishap messages 7
MODE 94

modes 93
MOVE 97

N

name 18
NEW 12
NEXT 18
NOT 35
null character 48

O

OLD 37
ON ERROR 91
Operating System 15
OR 34

P

Papert, S. 30
pitch 85
pitch increment 88
pixel 96
PLAY 20
PLOT 98
PRINT 4
PRINTTAB 22
PROC 5
procedure 5
program (computer-) 1
PROLOG 117
prompt 3

R

READ 59
RECORD 20
recursion 12
REM 8
REPEAT 34
reports 7
resolution 95
RESTORE 60
RIGHT$ 84
RND 35
RUN 9

S

SAVE 20
SOLVER 46
SOUND 85
SPC 64
SQR 35
STEP 18
step number 88
strings 67
structured programming 39
subscript 70

T

TAB 63
THEN 19
TO 18
top-down refinement 39
TRUE 34
TURTLE 24
turtle graphics 30
TV 3

U

UNTIL 34
User Guide 3

V

value 18
variable 18
VDU 95
voices 85

Special Characters:

" 4
$ 68
↓ 6
↑2 4
→ 6
← 6
?/ 4
BREAK 3
CAPS LK 3
COPY 6
DELETE 4
ESCAPE 12
FUNC 4
G 21
R 21
RETURN 3
SHIFT 3
T 6
* 32
*FX 91
+ 33
- 32
/ 33
< 34
<> 34
= (function result) 36
= (logical equivalence) 38
= (with LET) 18
> 34
^ 37
: 91

HEDGEHOG

by Alan Dickinson

Hedgehog is a really first class implementation of the "Frogger" type arcade game. It is fast moving, responsive, the graphics are good, and it makes pretty addictive playing. Essentially you are a hedgehog. You can move left, right or "scurry". Your aim in life is to scurry across a four lane dual carriageway and a busy railway track to gather acorns for supper. It is the rush hour, so the traffic is pretty busy, which means you need concentration and good "scurry" control. If you do get run over by a juggernaut or an Intercity 125, an ambulance will quickly drive to the scene.

You have three lives, and your score depends on your progress. As your score increases, so the traffic gets steadily worse. Playing tips:

1. Do not roll into a ball in the face of oncoming traffic.
2. Make good use of the rest point between the road and the railway track.

If you find the game too fast, then you may like to modify it to run in mode 2. It is a 'feature' of the Electron that it runs much slower in this mode. The mode is set in line 90. A further advantage of mode 2 is that you can use more colours in the display. To achieve this, change line 1810 to

```
1810 COLOUR (R%MOD5)+2
```

```
  10 REM PROGRAM.  HEDGEHOG
  20 REM AUTHOR.   Alan Dickinson
  30 REM VERSION   E1.2
  40 REM ELBUG November 1983
  50 REM Subject to COPYRIGHT
  60 :
  70 ON ERROR ON ERROR OFF:MODE6:REPOR
T:PRINT " at line ";ERL:END
  80 :
  90 MODE5
 100 VDU23,1,0;0;0;0;
 110 *FX9,25
 120 *FX10,25
 130 DIM R$(9):REM ROADS
 140 DIM A%(19):REM ACORNS
 150 :
 160 PROCINTRO
 170 PROCDEFINE
 180 PROCINIT
 190 REPEAT
 200  PROCGAME
 210  IF S%>T% PROCTOPSCORE
 220  PROCGAMEOVER
 230  TIME=0:REPEAT UNTIL TIME>200
 240  *FX15,1
 250  A$=GET$
 260 UNTIL FALSE
 270 :
 280 DEF PROCINTRO
 290  COLOUR 133
 300  CLS
 310  COLOUR 15
 320  PRINT''''"  H e d g e h o g"
 330  COLOUR 4
 340  PRINTTAB(2,14)"Controls..."
 350  PRINT'"  Z = LEFT"
 360  PRINT'"  X = RIGHT"
 370  PRINT'"  / = SCURRY"
 380  PRINTTAB(2,30)"Snatch acorns..."
;
 390  TIME=0:REPEAT UNTIL TIME>300
 400  COLOUR 8
 410  PRINTTAB(2,30)"Press any key..."
;
 420  A$=GET$
 430 ENDPROC
 440 :
 450 DEF PROCDEFINE
 460  VDU23,255,136,204,238,238,238,23
8,238,238
 470  VDU23,254,0,0,-1,-1,0,0,0,0
 480  VDU23,252,0,-1,-1,0,0,-1,-1,0
 490  VDU23,251,0,0,0,0,-1,-1,0,0
 500  VDU23,253,24,60,90,255,126,255,6
0,0
 510  VDU23,250,108,72,200,252,254,251
,127,60
 520  VDU23,249,24,60,60,60,0,126,60,24
 530  H$=CHR$17+CHR$1+CHR$253
 540  VDU23,224,15,105,105,249,255,255
,255,102
 550  VDU23,225,240,150,150,159,255,25
5,255,102
 560  VDU23,226,0,0,0,126,126,126,255,
102
```

```
  570  VDU23,227,0,126,126,126,126,126,
255,102
  580  VDU23,228,31,49,97,255,255,255,2
55,48
  590  VDU23,229,255,36,36,255,255,255,
255,0
  600  VDU23,230,248,140,134,255,255,25
5,255,24
  610  VDU23,231,0,31,17,17,255,191,255
,48
  620  VDU23,232,0,240,136,136,255,253,
255,12
  630  VDU23,233,255,255,255,255,255,25
5,255,28
  640  VDU23,234,255,239,199,239,255,25
5,221,28
  650 ENDPROC
  660 :
  670 DEF PROCINIT
  680  T%=500
  690  T$="Henry Hedgehog"
  700  S1$=" ":S2$="  "
  710  S3$="   ":S4$="    "
  720  S5$="     ":S6$="      "
  730  R$(0)=STRING$(20," ")
  740  R$(1)=S2$+CHR$227+CHR$226+CHR$22
7+CHR$227+CHR$225+S4$+CHR$226+CHR$225+S
5$+CHR$227+CHR$226+CHR$225+S4$
  750  R$(2)=CHR$224+CHR$226+CHR$227+CH
R$226+CHR$226+S5$+CHR$224+CHR$226+S3$+C
HR$224+CHR$227+CHR$227+CHR$226+S2$+CHR$
224+CHR$226+S3$
  760  R$(3)=CHR$228+CHR$229+CHR$229+CH
R$230+S4$+CHR$227+CHR$227+CHR$225+S6$+C
HR$228+CHR$229+CHR$230+S3$+CHR$226+CHR$
225+S1$
  770  R$(4)=CHR$228+CHR$229+CHR$229+CH
R$230+S4$+CHR$224+CHR$227+CHR$227+S6$+C
HR$228+CHR$229+CHR$230+S3$+CHR$224+CHR$
226+S1$
  780  R$(5)=STRING$(20," ")
  790  R$(6)=S2$+CHR$228+CHR$229+CHR$22
9+CHR$232+S5$+CHR$231+CHR$232+S5$+CHR$2
33+CHR$233+CHR$232+S1$+CHR$231+CHR$232+
S2$
  800  R$(7)=CHR$231+CHR$232+S2$+CHR$23
1+CHR$232+S2$+CHR$233+CHR$232+S5$+CHR$2
28+CHR$232+S1$+CHR$233+CHR$232+S5$
  810  R$(8)=CHR$231+CHR$232+S1$+CHR$23
1+CHR$232+S3$+CHR$231+CHR$233+S5$+CHR$2
31+CHR$230+S1$+CHR$231+CHR$233+S5$
  820  R$(9)=S4$+CHR$231+CHR$232+S1$+CH
R$231+CHR$229+CHR$229+CHR$230+S3$+CHR$2
31+CHR$233+S3$+CHR$231+CHR$233+S3$+CHR$
231+CHR$230+S1$
  830  FOR I%=1 TO 9
  840   R$(I%)=STRING$(5,R$(I%))
  850   R$(I%)=LEFT$(R$(I%),100)
  860  NEXT
  870 ENDPROC
  880 :
  890 DEF PROCGAME
  900  S%=-100:LEVEL%=-1:PROCHARDER
  910  N%=0
  920  REPEAT
  930   N%=N%+1:PROCGO
  940  UNTIL N%=3
  950  IF S%<1000 ENDPROC
  960  COLOUR 0:COLOUR 129:CLS
  970  PRINTTAB(2,10)"Bonus hedgehog";
  980  PRINTTAB(2,20)"May the fleas";
  990  PRINTTAB(2,22)" be with you";
 1000  FOR I%=0 TO 255 STEP8
 1010  SOUND&1,-12,I%,1
 1020  NEXT
 1030  *FX15,1
 1040  A$=INKEY$(200)
 1050  REPEAT:N%=N%+1:PROC_GO:UNTIL N%=
4
 1060 ENDPROC
 1070 :
 1080 DEF PROCGO
 1090  X%=10:Y%=30:Z%=10
 1100  PROCDRAWSCREEN
 1110  REPEAT
 1120  PROCROAD(1,0,12)
 1130  PROCROAD(6,0,22)
 1140  PROCROAD(7,0,24)
 1150  PROCROAD(4,1,18)
 1160  PROCROAD(8,1,26)
 1170  PROCROAD(9,1,28)
 1180  PROCROAD(7,0,24)
 1190  PROCROAD(2,1,14)
 1200  PROCROAD(8,1,26)
 1210  PROCROAD(3,0,16)
 1220  UNTIL Y%=0
 1230  IF ACORNS%=0 PROCHARDER
 1240 ENDPROC
 1250 :
 1260 DEF PROCDRAWSCREEN
 1270  COLOUR 0
 1280  COLOUR 128
 1290  CLS
 1300  COLOUR 129
 1310  PRINTTAB(1,4)SPC(17);
 1320  PRINTTAB(1,5)" H E D G E H O G "
;
 1330  PRINTTAB(1,6)SPC(17);
 1340  COLOUR3
 1350  COLOUR 128
 1360  PRINTTAB(1,1);N%;
 1370  PRINTTAB(0,10)STRING$(20,CHR$255
)
 1380  COLOUR 9
 1390  FOR I%=0 TO 19
 1400  IF A%(I%)=1 PRINTTAB(I%,10)CHR$2
49
 1410  NEXT
 1420  COLOUR 7
 1430  PRINTTAB(0,21)STRING$(20,CHR$254 )
```

```
 1440  PRINTTAB(0,23)STRING$(10,"- ")
 1450  PRINTTAB(0,25)STRING$(20,CHR$252
)
 1460  PRINTTAB(0,27)STRING$(10,"- ");
 1470  PRINTTAB(0,29)STRING$(20,CHR$251
)
 1480  PRINTTAB(10,1)"Score ";S%;
 1490  COLOUR13
 1500  PRINTTAB(0,20)R$(5);
 1510  PRINTTAB(X%,Y%)H$;
 1520 ENDPROC
 1530 :
 1540 DEF PROCHOG
 1550  IF Y%=0 ENDPROC
 1560  IF INKEY-98 AND X%>0 PROCLEFT EL
SE IF INKEY-67 AND X%<19 PROCRIGHT ELSE
 IF INKEY-105 PROCFWD
 1570  IFZ%<10 IF MID$(R$(Z%),X%+1,1)<>
S1$ PROCSPLAT
 1580 ENDPROC
 1590 :
 1600 DEF PROCLEFT
 1610  X%=X%-1:PRINTTAB(X%,Y%)H$;" ";
 1620 ENDPROC
 1630 :
 1640 DEF PROCRIGHT
 1650  PRINTTAB(X%,Y%)" ";H$;:X%=X%+1
 1660 ENDPROC
 1670 :
 1680 DEF PROCFWD
 1690  IF Z%=1 AND A%(X%)<>1 SOUND 1,-1
5,40,1:ENDPROC
 1700  Y%=Y%-2
 1710  Z%=Z%-1
 1720  PRINTTAB(X%,Y%)H$;TAB(X%,Y%+2)S1
$;
 1730  SOUND 1,-12,220,1
 1740  S%=S%+10
 1750  PRINTTAB(10,1)"Score ";S%;
 1760  IF Z%=0 PROCCHUCKLE
 1770 ENDPROC
 1780 :
 1790 DEF PROCROAD(R%,D%,SY%)
 1800  IF D%>0 R$(R%)=MID$(R$(R%),2,99)
+LEFT$(R$(R%),1) ELSE R$(R%)=MID$(R$(R%
),100,1)+LEFT$(R$(R%),99)
 1810  COLOUR (R%MOD2)+2
 1820  COLOUR 128
 1830  PRINTTAB(0,SY%)LEFT$(R$(R%),20);
 1840  IF SY%=Y% PRINTTAB(X%,Y%)H$;
 1850  PROCHOG
 1860  IF Y%=SY% IF MID$(R$(R%),X%+1,1)
<>S1$ PROCSPLAT
 1870  IF RND(80)=80 SOUND3,-15,1,10:SO
UND2,-15,9,8:SOUND1,-15,17,2
 1880 ENDPROC
 1890 :
 1900 DEF PROCSPLAT
 1910  IF Y%=0 ENDPROC
 1920  COLOUR 14
 1930  PRINTTAB(X%,Y%)"*";
 1940  VDU19,0,1,0,0,0
 1950  COLOUR 12
 1960  COLOUR 139
 1970  PRINTTAB(1,4)SPC(17);
 1980  PRINTTAB(1,5)"    S P L A T    "
;
 1990  PRINTTAB(1,6)SPC(17);
 2000  COLOUR 128
 2010  FOR I%=1 TO 15
 2020   SOUND 1,-5,255-10*I%,1
 2030  NEXT
 2040  COLOUR 1
 2050  PRINTTAB(X%,Y%)CHR$250;
 2060  VDU20
 2070  IF X%>10 AX%=0:AMB$=" "+CHR$234+
CHR$232 ELSE AX%=17:AMB$=CHR$231+CHR$23
4+" "
 2080  FOR I%=0 TO 15
 2090  IF AX%<X% PRINTTAB(AX%,Y%)AMB$;:
AX%=AX%+1
 2100  IF AX%>X% AX%=AX%-1:PRINTTAB(AX%
,Y%)AMB$;
 2110  FOR J%=0 TO 120 STEP2
 2120  SOUND&11,-I%,J%,5
 2130  NEXT
 2140  NEXT
 2150  Y%=0
 2160 ENDPROC
 2170 :
 2180 DEF PROCCHUCKLE
 2190  FOR I%=1 TO 25
 2200  J%=1
 2210   SOUND J%,-15+I%/3,200-RND(3)*I%
,1
 2220  NEXT
 2230  N%=N%-1:Y%=0:S%=S%+25:A%(X%)=0:A
CORNS%=ACORNS%-1
 2240 ENDPROC
 2250 :
 2260 DEF PROCHARDER
 2270  FOR I%=1 TO 3
 2280  FOR J%=30 TO 180 STEP8
 2290   SOUND &12,-11-I%,J%+12+I%*10,1
 2300  NEXT
 2310  NEXT
 2320  S%=S%+100
 2330  FOR I%=0 TO 19:A%(I%)=0:NEXT
 2340  FOR I%=1 TO 4
 2350   REPEAT
 2360    J%=RND(17)+1
 2370   UNTIL A%(J%)=0
 2380   A%(J%)=1
 2390  NEXT
 2400  ACORNS%=4
 2410  LEVEL%=LEVEL%-2*(LEVEL%<>9)
 2420  R$(5)=STRING$(LEVEL%,CHR$255)+ST
RING$(20-LEVEL%*2," ")+STRING$(LEVEL%,C
HR$255)
 2430 ENDPROC
```

```
2440 :
2450 DEF PROCTOPSCORE
2460  COLOUR 3
2470  COLOUR 129
2480  CLS
2490  PRINTTAB(1,3)"T O P - S C O R E";
2500  PRINTTAB(1,8)"Enter your name";
2510  PRINTTAB(1,10);
2520  FOR I%=100 TO 200 STEP 12
2530   SOUND 1,-15,I%,3
2540   SOUND 2,-14,I%+8,3
2550  NEXT
2560  *FX15,1
2570  INPUT ""T$
2580  T%=S%
2590 ENDPROC
2600 :
2610 DEF PROCGAMEOVER
2620  COLOUR 4
2630  COLOUR 133
2640  CLS
2650  PRINTTAB(5,3)"Super hog";
2660  COLOUR 15
2670  PRINTTAB((20-LEN(T$))DIV2,6)T$;
2680  COLOUR 4
2690  PRINTTAB(5,11)"Top score";
2700  COLOUR 0
2710  PRINTTAB(8,13);T%;
2720  COLOUR 4
2730  PRINTTAB(5,18)"Your score";
2740  COLOUR 0
2750  PRINTTAB(8,20);S%;
2760  COLOUR 4
2770  PRINTTAB(4,30)"Press any key";
2780 ENDPROC
```

This program was adapted from a version for the BBC micro first published in BEEBUG Vol.2 No.2.

HINTS HINTS HINTS HINTS HINTS HINTS HINTS HINTS HINTS

TRACE

This is a useful debugging function, allowing you to follow the computer's execution of your program. When it executes a line, the computer prints the line number on the screen in square brackets. From this, you can see the order in which the instructions are executed.

Tracing is initiated by typing:

TRACE ON <return>

and running the program. At the end, turn it off with:

TRACE OFF <return>

You may also use TRACE xxx, where xxx is the line you want the computer to trace up to. After that TRACE is automatically turned off, and normal execution continues.

SELF VALIDATING GET ROUTINE - M.Girling

When your program needs to ask a question seeking a single key response, it is very messy to check for every possible response in turn with a separate IF statement. The ON...INSTR...GOTO construction is much neater:

```
1000 PRINT "ANOTHER GAME (Y/N)";
1010 ON INSTR("YNyn",GET$) GOTO 100,200,100,200 ELSE 1010
```

This will go to line 100 on a 'yes' response and to line 200 for a 'no' response, and will loop around for another key if an illegal one is typed.

CALCULATING X SQUARED

When squaring or cubing a number, often needed in games programs, use X*X (or similar) not X^2 as X*X is much faster. Incidentally when using the Pythagoras theorem to calculate distances between, say, two spaceships on the screen, don't bother taking the square root, simply adjust the minimum distance to be in units squared.

PROGRAM LENGTH - Matthew Rapier

To find the length of the program in memory type:

PRINT TOP-PAGE <return>

This prints out the length of the program in bytes. Also, note that there is an abbreviation for PRINT, which is 'P.'

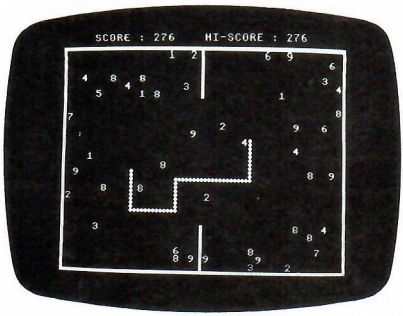
BEEBUGSOFT

SNAKE
for the Electron

Snake is a very addictive, fast moving arcade game. The purpose of the game is to direct the snake around the screen, eating up the randomly placed objects. With every bite that it takes, the tail grows longer and the snake moves faster. Just to complicate things, there are also certain scattered obstacles which must be avoided.

To even complete the first screen requires skill and concentration. Further frames use different shaped playing areas, which as well as adding variety, require much greater skill to complete.

This game is much more exciting than many games of a similar nature, and once played, proves to be surprisingly compulsive.



Snake costs £4.00 inc VAT. Please add 50p post & packing.
Overseas orders: £5.50 inc post & packing\-\VAT not charged.
Send order with membership number to:
BEEBUGSOFT, P.O. Box 109, High Wycombe, Bucks HP11 2TD.

IF YOU WRITE TO US

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Subscription and Software Address

ELBUG
PO BOX 109
High Wycombe
Bucks
HP11 2TD

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This is available from the software address.

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USING THE PROGRAMMABLE FUNCTION KEYS See page 24

ORBIT KEYSET	CASSETTE			CAT MOTOR ON	MOTOR OFF	MODE 6 DISPLAY	PROGRAM LENGTH	FREE MEMORY	ERROR LIST	FORMAT LIST	KEYSET ORBIT
	LOAD	CHAIN	VERIFY								